

**Network  
Administration  
Guide**

# hp StorageWorks Business Copy EVA/MA/EMA v2.2

**Product Version:** BC Server v2.2

Fifth Edition (October 2003)

**Part Number:** T3032-96101

This document describes the planning and operations required to establish, configure, update, and maintain a Business Copy network. The name "HP StorageWorks Business Copy (BC) for Enterprise Virtual Array (EVA), Modular Array (MA), and Enterprise Modular Array (EMA)" is the new name for "HP StorageWorks Enterprise Volume Manager (EVM)."



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Business Copy EVA/MA/EMA v2.2 Network Administration Guide  
Fifth Edition (October 2003)  
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## about this guide

This guide provides information to help you:

- Prepare for initial and update installations of BC software
- Maintain an existing BC network

“About this Guide” topics include:

- [Overview](#), page 12
- [Conventions](#), page 13
- [Getting Help](#), page 15

## Overview

This section covers:

- [Intended Audience](#)
- [Prerequisites](#)
- [Related Documentation](#)

## Intended Audience

This book is for anyone who is:

- Preparing an initial installation of a BC network
- Preparing to update BC software
- Maintaining and troubleshooting an existing BC network

## Prerequisites

Tasks in this book require knowledge of BC-supported:

- Storage Area Network (SAN) fabric configurations
- Host operating-system (OS) environments
- Storage systems
- Multibus failover configurations

## Related Documentation

- You can access technical documentation from the HP website:  
<http://h18000.www1.hp.com/products/storage/software/bizcopyeva/index.html>.

## Conventions

Conventions consist of the following:

- [Document Conventions](#)
- [Text Symbols](#)
- [Getting Help](#)

## Document Conventions

The document conventions included in [Table 1](#) apply in most cases.

**Table 1: Document Conventions**

Element	Convention
Cross-reference links	Blue text: <a href="#">Figure 1</a>
Key and field names, menu items, buttons, and dialog box titles	<b>Bold</b>
File names, application names, and text emphasis	<i>Italics</i>
User input, command and directory names, and system responses (output and messages)	Monospace font COMMAND NAMES are uppercase monospace font unless they are case sensitive
Variables	<monospace, italic font>
Website addresses	Blue, underlined sans serif font text: <a href="http://www.hp.com">http://www.hp.com</a>

## Text Symbols

The following symbols may be found in the text of this guide. They have the following meanings:



**WARNING:** Text set off in this manner indicates that failure to follow directions in the warning could result in bodily harm or death.



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**Caution:** Text set off in this manner indicates that failure to follow directions could result in damage to equipment or data.

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**Note:** Text set off in this manner presents commentary, sidelights, or interesting points of information.

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## Getting Help

If you still have a question after reading this guide, contact an HP authorized service provider or access our website: <http://www.hp.com>.

## HP Technical Support

Telephone numbers for worldwide technical support are listed on the following HP website: <http://www.hp.com/support/>. From this website, select the country of origin.

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**Note:** For continuous quality improvement, calls may be recorded or monitored.

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Be sure to have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

## HP Storage Website

The HP website has the latest information on this product, as well as the latest drivers. Access storage at: <http://www.hp.com/country/us/eng/prodserv/storage.html>. From this website, select the appropriate product or solution.

You can provide feedback on BC by sending email to: [BCFeedback@hp.com](mailto:BCFeedback@hp.com).

## HP Authorized Reseller

For the name of your nearest HP authorized reseller:

- In the United States, call 1-800-345-1518
- In Canada, call 1-800-263-5868
- Elsewhere, see the HP website for locations and telephone numbers: <http://www.hp.com>.





# Getting Started

## 1

This chapter describes how to use this guide and provides release information. Topics include:

- [Steps for Creating and Updating a BC Network](#), page 18
- [What's New for BC 2.2](#), page 21
- [BC Software](#), page 23
- [BC Kit History](#), page 24
- [Providing Product Feedback](#), page 25

## Steps for Creating and Updating a BC Network

This section contains task maps for new and existing BC customers.

### Task Map: New BC Customers

[Table 2](#) lists the high-level steps for configuring, installing, and creating BC jobs.

**Table 2: Steps For Creating the BC Network Environment**

Steps	Tasks	Where to Go...
1	<div>Check important documents</div> <p>Check Release Notes for last-minute issues that you need to be aware of. Check Read Me First for critical information to ensure successful installation and configuration.</p>	<ul style="list-style-type: none"> <li>■ BC Read Me First</li> <li>■ BC Release Notes</li> </ul>
2	<div>Plan and configure BC network</div> <ul style="list-style-type: none"> <li>■ Plan your BC network.</li> <li>■ Determine BC software requirements and support.</li> </ul>	<ul style="list-style-type: none"> <li>■ BC Network Administration Guide, <a href="#">Chapter 3, "Planning a New BC Network"</a></li> <li>■ BC Network Administration Guide, <a href="#">Chapter 4, "BC Requirements and Support"</a></li> </ul>
3	<div>Install BC Server and Host Agent software</div> <ul style="list-style-type: none"> <li>■ Install the BC Server software.</li> <li>■ Install appropriate host agent software.</li> </ul>	<ul style="list-style-type: none"> <li>■ BC Server Installation Guide</li> <li>■ BC Host Installation Guide (by OS)</li> </ul>
4	<div>Start the BC GUI</div> <p>Browse to the BC GUI.</p>	<p>BC Network Administration Guide, <a href="#">Chapter 5, "Starting and Browsing to BC"</a></p>

Table 2: Steps For Creating the BC Network Environment (Continued)

Steps	Tasks	Where to Go...
5	<div>Plan, create, and test BC jobs</div> <ul style="list-style-type: none"> <li>Plan jobs, review rules and best practices.</li> <li>If you are using volume groups or domains, review requirements and support.</li> <li>Create jobs using the BC GUI or command line interface (EVMCL).</li> </ul>	<ul style="list-style-type: none"> <li>BC GUI Online Help &amp; User Guide</li> <li>BC Network Administration Guide, <a href="#">Chapter 8, "Using Volume Groups and Domains"</a></li> <li>BC GUI Online Help &amp; User Guide</li> </ul>
6	<div>Review best practices</div> <p>Review best practices and optimizations.</p>	BC Network Administration Guide, <a href="#">Chapter 7, "Best Practices and Maintenance Tasks"</a>
<i>BC environment is up and running</i>		
Maintenance tasks	Perform post-installation tasks as necessary.	BC Network Administration Guide, <a href="#">Chapter 7, "Best Practices and Maintenance Tasks"</a>
Troubleshooting	Reference known problems and issues as necessary.	BC Network Administration Guide, <a href="#">Chapter 9, "Troubleshooting"</a>

## Task Map: Update Customers

Table 3 lists the high-level steps for updating a BC Network.

**Table 3: Steps For Updating a BC Network**

Steps	Tasks	Where to Go...
1	<div>Check important documents</div> <p>Check Release Notes for last-minute issues that you need to be aware of. Check Read Me First for critical information to ensure successful installation and configuration.</p>	<ul style="list-style-type: none"> <li>■ BC Read Me First</li> <li>■ BC Release Notes</li> </ul>
2	<div>Prepare to update</div> <p>Review requirements for updating to this release.</p> <p>Review the steps for updating software.</p>	<ul style="list-style-type: none"> <li>■ BC Network Administration Guide, <a href="#">Chapter 4, "BC Requirements and Support"</a></li> <li>■ Network Administration Guide, <a href="#">Chapter 6, "Preparing to Update a BC Network"</a></li> </ul>
3	<div>Install the update for BC Server, host agents, and other required software updates.</div> <p>Install the BC update software and other required software updates.</p>	<ul style="list-style-type: none"> <li>■ Go to: <a href="http://h18000.www1.hp.com/products/storage/software/bizcopyeva/index.html">http://h18000.www1.hp.com/products/storage/software/bizcopyeva/index.html</a></li> </ul>
4	<div>If necessary, update jobs</div> <p>Review Release Notes and Read Me First to see if you need to change existing jobs because of new operations, changes to syntax, new functionality, or incompatibility.</p>	<ul style="list-style-type: none"> <li>■ BC Release Notes</li> <li>■ BC Read Me First</li> </ul>

## What's New for BC 2.2

Table 4 lists the new features and changes in the BC 2.2 release.

**Table 4: What's New for BC 2.2**

Feature	Description
Added OpenVMS host agent support	Added support for OpenVMS V7.2-2 (64-bit) with FIBRE_SCSI-V0500--4.PCSI Tima Kit and OpenVMS V7.3-1 (64-bit). See <a href="#">"OpenVMS Requirements and Support"</a> on page 61.
Added host agent version support	Added host agent support for Sun Solaris 9, IBM AIX v5.2, HP-UX™ 11.23, HP Tru64 UNIX® v5.1B, Microsoft® Windows® Server 2003 Enterprise Edition, 64-bit. See <a href="#">"Host Agent Requirements and Support"</a> on page 58.
Added FCAs and HBAs	See <a href="#">"Host Agent Requirements and Support"</a> on page 58.
Added BCV remount capability	<i>All OSs except Tru64 UNIX:</i> In a BC job, you can mount a BCV created within the job, unmount the BCV, then mount the BCV on a different host. (Previously, a BCV could only be mounted once in a job.) <i>Windows and Solaris Only:</i> In one job, you mount a BCV. In a second job, you unmount the BCV, then remount the BCV on a different host. Refer to the BC GUI Online Help & User Guide.
Expanded mount capability	<i>For Windows and Solaris Only:</i> In a BC job, you can unmount a specific volume from a host. This capability is enabled with the new <code>SET VOLUME_BCV</code> and <code>UNMOUNT</code> operations. <i>For all OSs:</i> In a BC job, you can mount StorageWorks virtual disks that are not created by BC, or are created in another BC job. This capability is enabled with the new <code>SET UNIT_BCV</code> operation. Refer to the BC GUI Online Help & User Guide.

**Table 4: What's New for BC 2.2 (Continued)**

Feature	Description
Change in SMA package support	<p><i>For EVAs:</i> v2.0, SP1a with CV EVA 3.0A or v2.1 with CV EVA 3.1</p> <p><i>For MA/EMAs:</i> v2.0, SP1a with HSG Element Manager 1.0E or v2.1 with HSG Element Manager 1.0F See <a href="#">"BC Server/SMA Requirements and Support"</a> on page 54.</p>
Added Continuous Access EVA configuration support	<p>Added support for storage systems and host agents running at both the source and destination sites in Continuous Access EVA environments.</p> <p>Added SET CA SUBSYSTEM operation for BC jobs for specifying the storage system for volumes. You must use this operation in BC jobs when specifying a volume in Continuous Access EVA environments. This operation solves the problem in BC 2.1a where BC could not resolve duplicate World Wide Names for virtual disks. If you are updating from BC 2.1a, you no longer have to deselect CA storage in the BC GUI <b>Configuration Page &gt; Subsystem Options</b>.</p> <p>Refer to the <i>Using BC with Continuous Access EVA and Data Replication Manager Application Notes</i>, and the Online Help &amp; User Guide.</p>
Fixed HSG snapshot limitation for AIX and Tru64 UNIX	Snapshot functionality is now supported on AIX and Tru64 UNIX.
Enhanced BC GUI	<p>Enhanced the Resources page to display volume groups and logical volumes.</p> <p>Refer to the BC GUI Online Help &amp; User Guide.</p>

## BC Software

This BC release is available to new customers in kit form, and to current customers who want to update their existing EVM V2.0x (2.0, 2.0C, 2.0D) network as a Web-only download.

## BC Software Kit

Table 5 lists the BC software kit contents.

**Table 5: BC Software Kit Contents**

Component	Format	Description
BC Server	One CD-ROM	Software for installing the BC server on a storage management appliance (SMA).
BC Host Agents	One CD-ROM	Software for installing the BC host agents on computers with the following supported host operating systems: AIX, HP-UX, Tru64 UNIX, OpenVMS, Solaris, Windows 2000, Windows NT®, and Windows Server 2003.
Documentation	CD-ROM with technical documents as portable data format (PDF) files, and OS-specific online Help & User Guide files.	<p>Documents consisting of:</p> <ul style="list-style-type: none"> <li>■ BC Read Me First</li> <li>■ BC Network Administration Guide</li> <li>■ BC Server Installation Guide</li> <li>■ BC Host Agent Installation Guides (by OS)</li> <li>■ BC Server Release Notes</li> <li>■ BC Host Agent Release Notes (by OS)</li> <li>■ BC Online Help &amp; User Guide</li> <li>■ Using BC with Continuous Access EVA and Data Replication Manager Application Notes</li> </ul> <p>For part numbers of documents, refer to the BC Read Me First.</p>

## BC Update Software

To download BC v2.2 update software from the HP website, go to:  
<http://h18000.www1.hp.com/products/storage/software/bizcopyeva/index.html>  
 and click **software & drivers**.

## BC Kit History

[Table 6](#) lists the BC kit history.

**Table 6: BC Kit History**

Release Date	Version	Software Contents
October 2001	EVM V2.0	EVM Server V2.0 EVM Host Agent V2.0 for Windows 2000/NT
August 2002	EVM V2.0D	EVM Server V2.0D EVM Host Agent V2.0D for Tru64 UNIX, HP-UX, AIX, Solaris, and Windows 2000/NT
March 2003	BC v2.1	BC Server v2.1 BC Host Agent v2.1 for Tru64 UNIX, HP-UX, AIX, Solaris, and Windows 2000/NT
May 2003	BC v2.1a	BC Server v2.1a BC Host Agent v2.1a for Tru64 UNIX, HP-UX, AIX, Solaris, and Windows 2000/NT/2003
October 2003	BC v.2.2	BC Server v2.2 BC Host Agent v.2.2 for Tru64 UNIX, HP-UX, AIX, Solaris, Windows 2000/NT/2003, and OpenVMS



## Providing Product Feedback

To submit comments regarding BC, send email to: [BCFeedback@hp.com](mailto:BCFeedback@hp.com).



# Introduction to BC

## 2

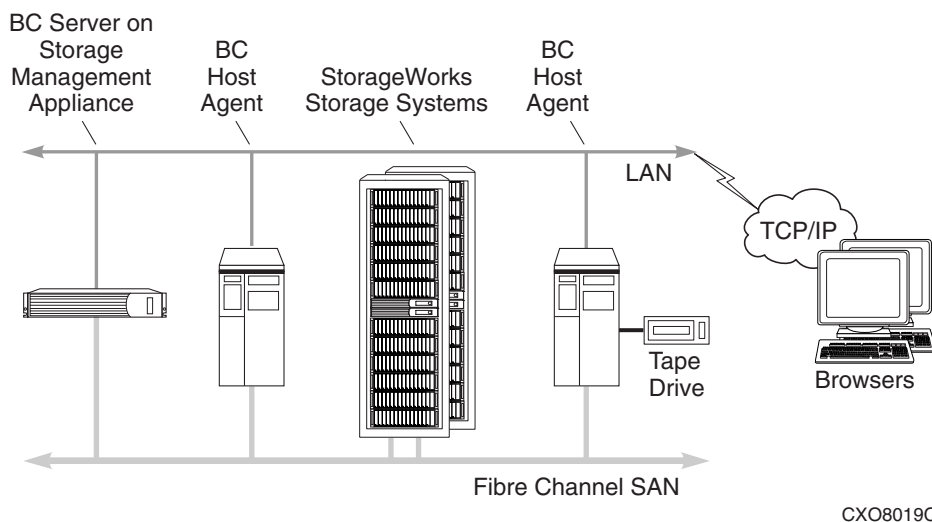
This chapter describes components of a BC network. Topics include:

- [What Is BC?](#), page 28
- [BC Components](#), page 29

## What Is BC?

BC is an application program that makes point-in-time copies of storage volumes. These copies, called Business Continuance Volumes (BCVs), can be mounted dynamically on any other supported host in the BC storage network.

To replicate storage volumes, you must create a BC network. [Figure 1](#) shows a typical BC network.



CXO8019C

**Figure 1: BC network configuration**

The BC network consists of the following hardware and software components:

- One Storage Management Appliance (SMA)
- BC server software, which runs on the SMA
- Device managers/element managers, which run on the SMA
- One or more host computers
- BC host agent software, which run on host computer systems
- One or more HP StorageWorks storage systems

## BC Components

This section details the components in a BC network.

### Storage Systems

StorageWorks storage systems provide the storage that is used in BC jobs.

### BC Network

A BC network is often a subset of an existing Fibre Channel SAN. The SAN consists of host computers, StorageWorks storage systems, and switches that are connected by fiber optic cabling. The Fibre Channel carries storage data transmitted between StorageWorks storage systems and host computers.

The computers in a BC network are also connected by a LAN and communicate with each other through a TCP/IP connection. The LAN carries command and status data transmitted between network components.

The BC network and its associated StorageWorks storage systems can be managed remotely using a Web browser. From the Web browser, you can log into the SMA and the BC server and access the BC GUI.

### SMAs and Device Managers/Element Managers

The SMA provides a centralized facility for managing and monitoring SAN elements, including storage arrays. SMA software includes *device managers* for HSV-based storage systems, and *element managers* for HSG-based storage systems. The device managers/element managers allow you to manage storage through a GUI interface, which is accessed through a Web browser. The BC server software runs on the SMA hardware.

### BC Server

The BC server software is installed on the SMA and controls all activities within the BC network. The BC server software provides:

- An engine for running BC storage-replication jobs.
- BC job creation and job management functions. These features allow the creation, validation, and management of jobs. All BC jobs are stored on the SMA.

- Jobs, BC Resources, Logs, and Configuration pages. These pages provide information that helps to create and manage jobs, identify available resources, view BC activities, and manage storage system visibility.
- An HTTP server for BC. The HTTP server allows the use of a Web browser to access all of the features of BC.

## Host Agents

The BC host agent software is installed on a host computer. This software:

- Provides communication between the host computer and the BC server.
- Performs all activities associated with running BC jobs within the BC network, as directed by the BC server.
- Provides a command line interface (EVMCL) for creating and running BC jobs.

# Planning a New BC Network

## 3

This chapter provides information on planning a new BC network. Topics include:

- [Configuration Planning](#), page 32
- [Storage Systems Planning](#), page 36
- [Server and SMA Planning](#), page 38
- [Host Computer Planning](#), page 39
- [Firewall Planning](#), page 44
- [BC with Continuous Access EVA and Data Replication Manager](#), page 45

## Configuration Planning

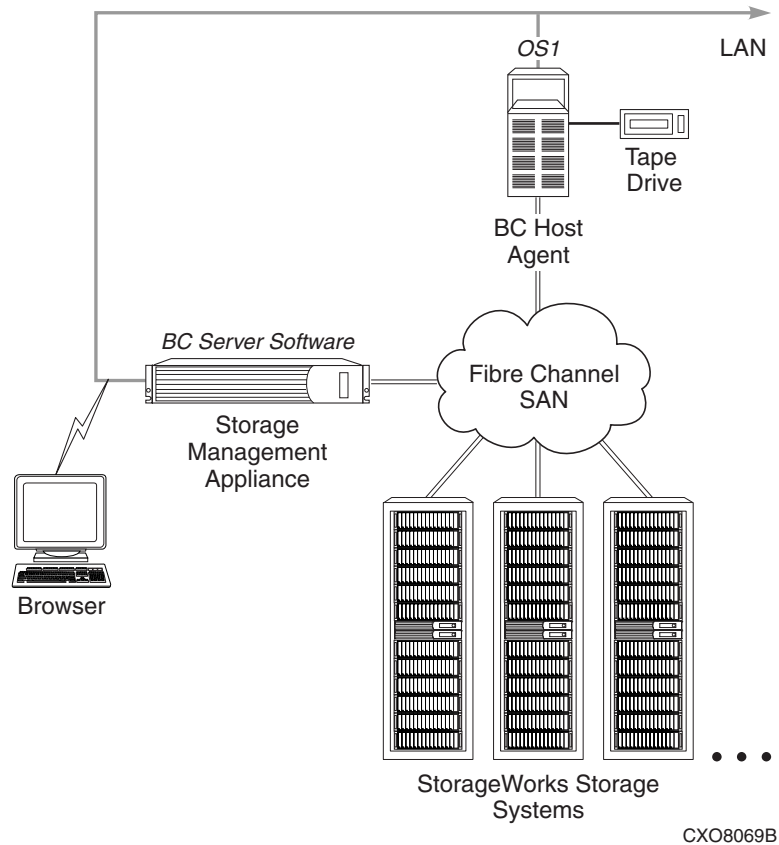
A valid BC SAN configuration is one in which one or more host computers are connected by Fibre Channel to StorageWorks storage systems. BC is compatible only with multibus failover SAN configurations and Switched Fabric Fibre Channel environments. For detailed information on supported SAN configurations, refer to the StorageWorks storage system documentation.

The following examples show possible BC network configurations. The configuration that you design will be different, depending on whether the network is for centralized backup, data warehousing, or application testing.



## Example 1: BC Host Agent on One Host Computer

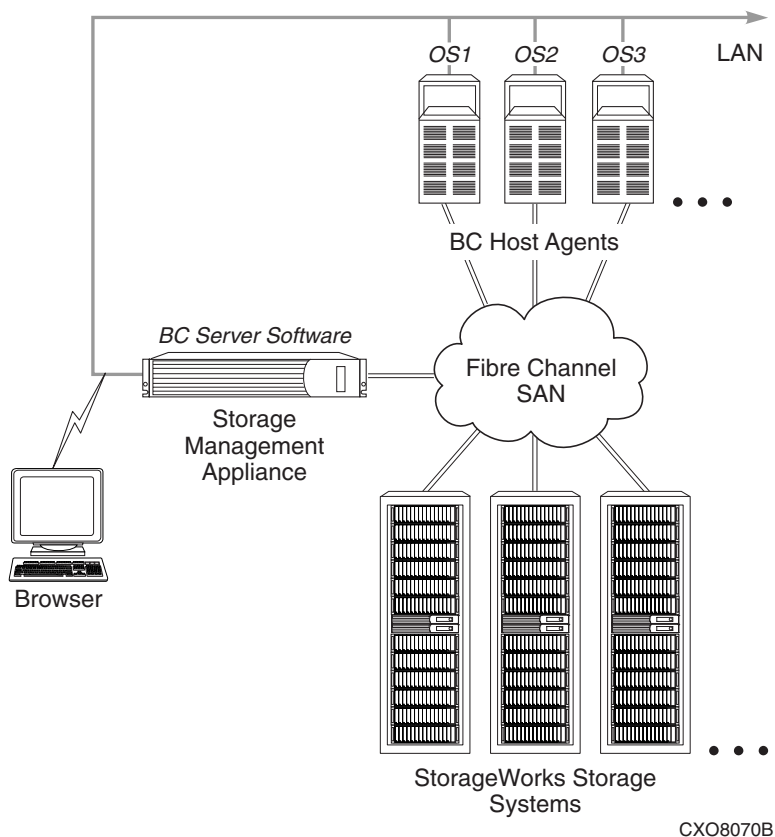
The basic configuration in [Figure 2](#) is good for providing nearline storage and tape backups of volumes on StorageWorks storage systems. Only two BC installations are required to create this configuration: a BC server on an SMA and a BC host agent on a host computer.



**Figure 2: BC SAN configuration with one host computer**

## Example 2: BC on Multiple Host Computers

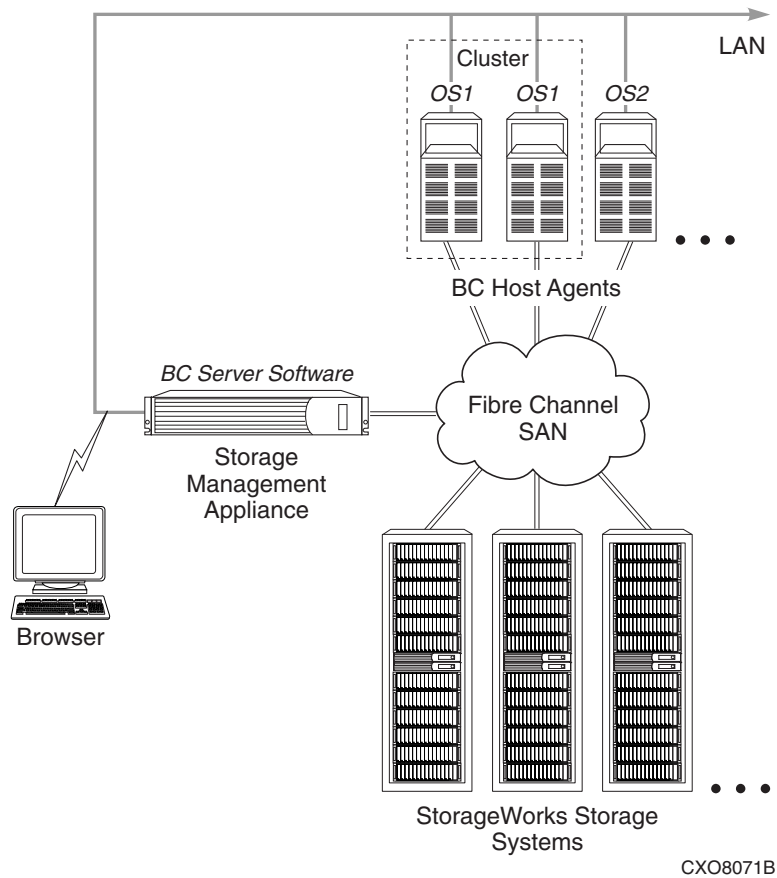
BC can mount replicated volumes on any of the host agent computers. There can be an unlimited number of host agent computers and any of them can run any of the supported operating systems. The configuration in [Figure 3](#) allows for several possible uses. For example, the host agent computer running operating system 2 (OS2) might perform tests on copies of transaction records produced by the application on the host agent computer running OS1. The host agent computer running OS3 could be a dedicated tape backup server that saves daily transactions from the application running on the OS1 computer and also backs up testing results from the computer running OS2.



**Figure 3: BC SAN configuration with multiple host computers**

### Example 3: Business Copy on Multiple Hosts for High Availability

The configuration in [Figure 4](#) adds clustering to the application server. There is no limit on the number of clusters that may be included in a BC network. The configuration for the computers running OS1 and OS2 includes dual-bus fault tolerance using HP Secure Path.



**Figure 4: BC SAN configuration with clustered host computers**

## Storage Systems Planning

A BC network must include at least one storage system. For the best overall performance, a BC network should include only storage systems that you intend to use in BC jobs.

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**Note:** BC can simultaneously support up to 25 HSG-based storage systems and up to 16 HSV-based storage systems. However, as the number of storage systems increases, BC job performance and user-interface responsiveness can degrade. Actual performance depends on several factors, including the number of jobs running, the number of steps and complexity of the jobs, and I/O activity on the storage systems and hosts.

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If your BC network must include storage systems that you do not intend to use with BC, you can deselect them in the BC GUI. This improves BC performance but does not limit the use of these storage systems outside of BC. For best practices on storage systems, see [“Optimizing Performance”](#) on page 86.

For specific requirements and versions, see [Chapter 4, “BC Requirements and Support.”](#)

## HSG-based Storage Systems

With HSG-based storage systems, you should:

- Identify the HSG-based storage systems, if any, that you want to use in the BC network and make sure you have the appropriate licenses.
- Ensure that the number of storage systems does not exceed the number that the SMA supports.
- Ensure that each HSG-based storage system is controlled by an element manager (and not by a StorageWorks Command Console agent).
- Ensure that BC-supported Array Controller Software (ACS) configured with multibus failover has been installed on each HSG-based storage system.

## HSV-based Storage Systems

With HSV-based storage systems, you should:

- Identify the HSV-based storage systems, if any, that you want to use in the BC network and make sure you have the appropriate licenses.
- Ensure that the number of storage systems does not exceed the number that the SMA supports.
- Ensure that a BC-supported VCS with snapshot license has been installed on each HSV-based storage system.

## Server and SMA Planning

A BC network must include one, and only one, BC server running on an SMA. BC can access only those storage systems controlled by device managers/element managers that are on the same SMA as the BC server software.

If your SAN configuration (and planned BC network) includes more than one SMA, select the SMA on which to install the BC server software. Any other SMAs should be excluded from (zoned out of) the BC network.

For specific requirements and versions, see [Chapter 4, “BC Requirements and Support.”](#)

## Storage Management Appliance

With SMAs you should:

- Identify the SMA that you want to use with BC.
- Ensure that the storage you want to use with BC is controlled by the device manager/element manager on that SMA.
- Ensure that the SMA is on the same LAN as the planned BC host computers.
- Ensure that the SMA is running a BC-supported version of the SMA software.
- Consider changing the default name (a serial number) of the SMA.

HP recommends that you rename the SMA to a name that you can recognize before installing the BC server software. Renaming at this point facilitates easy replacement in the event of an SMA failure. After the BC server is installed, renaming involves removing and reinstalling software. For renaming instructions, see [“Renaming and Replacing an SMA”](#) on page 95.

## Device Managers and Element Managers

The BC server uses device managers/element managers to communicate with storage systems. Depending on the version, they may be preinstalled on the SMA and configured to start automatically during startup. Device managers/element managers must remain running at all times to allow BC communication with storage systems. BC recognizes and communicates only with storage systems that are presented by these device managers/element managers.

## Host Computer Planning

A BC network can include BC-enabled and non-BC-enabled host computers.

[Table 7](#) provides an overview of the differences.

**Table 7: Host Computer Options**

If a Host is...	The Host...	And Requires...
BC-enabled	Can communicate with BC and perform all activities associated with running BC jobs, including: <ul style="list-style-type: none"> <li>■ Replicating storage volumes by specifying the host name</li> <li>■ Suspending or resuming host I/O in conjunction with replication</li> <li>■ Mounting volumes on the host</li> <li>■ Launching an external job or issuing a host command</li> <li>■ Viewing, discovering, and deleting hosts in the BC GUI</li> </ul>	Host agent software installed on the host computer.
Not BC-enabled	Has limited functionality, but you can acquire additional software utilities to write your own scripts for communicating with the BC server and to run jobs.	A script utility and an OS with basic support (described in the following section)

## Support of Storage Systems and Host OSs

BC supports several types of storage systems and host OSs. For current support information and a list of supported OSs, see the Business Copy product page website: <http://h18000.www1.hp.com/products/storage/software/bizcopyeva/index.html>.

Host OSs are characterized as having basic support or enhanced support. With both types of support BC provides:

- Replication firmware and licenses for storage systems
- BC server software and GUI
- OS-neutral operations that are valid with storage system syntax

With enhanced support, BC also provides:

- BC host agent software and a command line interface (EVMCL)
- OS-specific replication operations that are valid with host volume syntax
- OS-specific operations to mount replicated volumes on a host
- OS-specific operations to suspend, resume, and launch host applications

## Features Versus OS Support

Table 8 identifies BC features that are included in basic and enhanced support. For features marked No under basic support, an equivalent functionality can be implemented through custom scripts written with the HP StorageWorks Storage System Scripting Utility (SSSU) or Command Scripter.

**Table 8: Features Versus Operating System Support**

Software Requirement or Supported Feature	Basic	Enhanced
<b>General Features</b>		
Replication firmware and license	Yes	Yes
BC server software with GUI	Yes	Yes
BC host agent software with command line interface	No	Yes
<b>Storage Replication Features</b>		
Create snapshots and snapclones on EVA storage systems	Yes	Yes
Create snapshots and clones on MA/EMA storage systems	Yes	Yes
<b>BC Server Software Features</b>		
Automatically discover storage system resources	Yes	Yes
Automatically discover hosts and mounted volumes	No	Yes
Use browser to access BC GUI	Yes	Yes
Use host command line to access BC jobs	No	Yes
Display storage resources in BC GUI	Yes	Yes
Display host resources in BC GUI	No	Yes
Create and manage automated replication jobs in BC GUI	Yes	Yes
■ Replicate by specifying storage system virtual disks	Yes	Yes
■ Replicate by specifying host volume drive letters or mount points	No	Yes
■ Suspend, resume or launch host applications	No	Yes



**Table 8: Features Versus Operating System Support (Continued)**

Software Requirement or Supported Feature	Basic	Enhanced
■ Mount replicated volumes on hosts	No	Yes
Run BC jobs via GUI	Yes	Yes
Run BC jobs via host command line, batch file, or scheduler	No	Yes
<b>BC Host Interaction Features</b>		
Interact with host applications from SSSU for EVA	Yes	Yes
Interact with host applications from Command Scriptor for MA/EMA	Yes	Yes
Interact with host applications from within BC jobs	No	Yes

## Job Operations Versus OS Support

Table 9 identifies individual BC job operations that are valid with basic and enhanced support. For job operations marked No under basic support, an equivalent functionality can be implemented through custom scripts written with SSSU or Command Scriptor.

**Table 9: Job Operations Versus Operating System Support**

Job Operation	Valid for OS with Basic Support	Valid for OS with Enhanced Support
; (comment)	Yes	Yes
CLONE UNIT	Yes	Yes
CLONE VOLUME	No	Yes
DELAY	Yes	Yes
LAUNCH	No	Yes
LAUNCHUNDO	No	Yes
MOUNT (Select BCV)	No	Yes
MOUNT VOLUME_ALL	No	Yes
MOUNT VOLUME_SINGLE	No	Yes
MOUNT UNIT	No	Yes
NORMALIZE UNIT	Yes	Yes
NORMALIZE VOLUME	No	Yes
PAUSE	Yes	Yes

**Table 9: Job Operations Versus Operating System Support (Continued)**

<b>Job Operation</b>	<b>Valid for OS with Basic Support</b>	<b>Valid for OS with Enhanced Support</b>
RESUME	No	Yes
SET CA_SUBSYSTEM	No	Yes
SET DISKGROUP	Yes	Yes
SNAP UNIT_BCV	No	Yes
SNAP VOLUME_BCV	No	Yes
SPLIT UNIT	Yes	Yes
SPLIT VOLUME	No	Yes
SPLIT_BEGIN UNIT	Yes	Yes
SPLIT_BEGIN VOLUME	No	Yes
SPLIT_FINISH UNIT	Yes	Yes
SPLIT_FINISH VOLUME	No	Yes
SUSPEND	No	Yes
UNDO	Yes	Yes
WAITUNTIL	Yes	Yes

## Storage System Scripting Utilities

Table 10 describes the storage system scripting utilities.

**Table 10: Scripting Utilities**

Storage Type	Scripting Utility	Description
EVA	Storage System Scripting Utility (SSSU)	For host OSs with basic support, the SSSU may be used to create custom scripts for use with EVA storage systems. These scripts can be used to provide features and operations like those built into BC host agents.  The SSSU is provided in the HP StorageWorks Operating System Solution Kit. The SSSU Reference Guide can be found at: <a href="http://h18000.www1.hp.com/products/storage/software/bizcopyeva/index.html">http://h18000.www1.hp.com/products/storage/software/bizcopyeva/index.html</a> .
MA/EMA	Command Scripter	For host OSs with basic support, Command Scripter can be used to create custom scripts for use with MA/EMA storage systems. These scripts provide features and operations similar to those built into BC host agents. To download Command Scripter go to: <a href="http://h18004.www1.hp.com/products/sanworks/softwaredrivers/commandscripter/index.html">http://h18004.www1.hp.com/products/sanworks/softwaredrivers/commandscripter/index.html</a> .

## Host Operating System, FCA, HBA, and LAN

With host operating systems you should ensure that each host is:

- Running a BC-supported operating system
- Connected to storage systems via BC-supported FCAs (Fibre Channel Adapters) or HBAs
- Located on the same LAN as the SMA

## Firewall Planning

If your BC server and host agent computers are on different sides of a firewall, you must open specific TCP ports. See “[BC Network Requirements](#)” on page 48 for required ports.

## **BC with Continuous Access EVA and Data Replication Manager**

If BC will be a part of a Continuous Access EVA or Data Replication Manager (DRM) environment, refer to *Using BC v2.2 with Continuous Access EVA and Data Replication Manager Application Notes* for planning and requirements.



# BC Requirements and Support

## 4

This chapter lists the requirements and support for configuring components in a BC network. Topics include:

- [BC Network Requirements](#), page 48
- [Sample Configuration Worksheets](#), page 49
- [Storage Systems Requirements and Support](#), page 52
- [BC Server/SMA Requirements and Support](#), page 54
- [Browser/JRE Requirements and Support](#), page 55
- [Host Agent Requirements and Support](#), page 58
- [Cluster Limitations and Recommendations](#), page 69

## BC Network Requirements

[Table 11](#) lists the required components in a BC network.

**Table 11: Required BC Network Components**

Component	Required
Storage systems and element managers	<ul style="list-style-type: none"><li>■ At least one storage system per BC network with required licenses</li><li>■ If HSG-based storage is present, one HSG Element Manager</li><li>■ If HSV-based storage is present, one HSV Element Manager</li></ul>
BC Server/SMA software	One (and only one) BC server per BC network installed on the SMA
Browser/JRE	At least one supported browsing computer and JRE to access the BC GUI
Host Agents	At least one host computer per BC network
Component	Supported
Firewalls	If your BC server and host agents are on different sides of a firewall, you must open the following ports: 4991, 4992, 4993, 4995



## Sample Configuration Worksheets

This section contains sample worksheets for configuring a new or existing BC network. [Appendix A](#) provides blank worksheets for printing.

### Sample Worksheet: BC Network Components

This worksheet shows sample update tasks required to establish a new BC network.

Component Name	Current Version	Tasks
BC Server	None	Install BC Server v2.2
SMA Name	SWMAN123456	Rename from default serial number before installing BC
SMA Software	OSM v1.0C SP3	Update to v2.0, SP1a or V2.1
Element Manager	HSG: v1.0D	Update to V1.0E or V1.0F
	Command View EVA: v2.1	Update to v3.0A or V3.1
Firewall	n/a	Open ports: 4991, 4992, 4993, 4995

**Figure 5: Sample Worksheet—BC network components**

## Sample Worksheet: Host Computer

This sample worksheet shows sample tasks for updating existing hosts.

Host Computer Name		Components				Tasks
		OS	FCA HBA	Solution Kit	Secure Path	
1	Colorado_1	Windows 2000	OK	OK	<b>change</b>	Update to Secure Path V4.0B or V4.0C
2	California_1	Tru64 UNIX	<b>change</b>	<b>change</b>	n/a	Update Emulex LightPulse to LP9002 Update HSG Solution Kit to ACS V8.7-3
3	Nevada_2	HP-UX	OK	<b>change</b>	<b>change</b>	Update HSV Solution Kit to V2.0 Update Secure Path to V3.0C
4	Utah_1	AIX	<b>change</b>	<b>change</b>	<b>change</b>	Update to Cambex FibreQuik PC1000F Update HSV Solution Kit to VCS V3.010 Update Secure Path to V2.0C
5	Utah_2	Solaris	<b>change</b>	<b>change</b>	OK	Update to QLogic SANblade 2300 Series Update HSV Solution Kit to V3.010

**Figure 6: Sample Worksheet—host computer**

## Sample Worksheet: Storage Systems

This sample worksheet shows sample update tasks for updating existing storage systems.

Storage System Name	Components		Tasks
	Controller	ACS /VCS	
1 SUBSYS03	HSG	<b>change</b>	Update to 8.7-3
2 SUBSYS04	HSG	<b>change</b>	Reconfigure to multibus failover
3 SUBSYS10	HSG	<b>change</b>	Remove SWCC software (not supported in BC network)
4 system16	HSV	OK	--
5 system20	HSV	<b>change</b>	Update to VCS 2.006, 3.0, or 3.010 with Command View EVA 3.0A or 3.1

**Figure 7: Sample Worksheet—storage systems**

## Storage Systems Requirements and Support

Table 12, Table 13, and Table 14 list storage system requirements and support.

**Table 12: HSG-based Storage Systems**

Component	Required	Remarks
Models	MA8000 or RA8000 EMA12000 or ESA12000 or EMA16000	Storage arrays
ACS	8.6-13 (F, S, or P) or 8.7-3 (F, S, or P)	F = clone application only S = cloned and snapshot P = clone and snapshot replication HP recommends using ACS 8.7 with BC.
Controllers	Dual controllers configured for multibus failover	Transparent failover is not supported by BC.
SAN Connections	To the SMA and all BC hosts	Fibre Channel
Component	Supported	Not Supported
Maximum Number of Storage Systems	25 BC supports the maximum allowed by the combination of SMA, SMA software, and Element Manager	
StorageWorks Command Console (SWCC)		SWCC managed storage cannot be included in a BC network. BC does not allow an SWCC HS-Series agent to access the same storage as a BC host agent.

**Table 13: HSG Snapshot Replication**

Component	Required	Remarks
Controllers	Dual controllers configured for multibus failover	Transparent failover is not supported by BC.
Cached Memory	512 MB per controller	Memory must be mirrored.
ACS	8.6-13 (S or P or F) or 8.7-3 (S or P or F)	F = clone application only S = snapshot and clone P = clone and snapshot replication

**Table 13: HSG Snapshot Replication (Continued)**

Component	Required	Remarks
SAN Topology	Fibre Channel switched fabric	To BC server and all BC hosts

**Table 14: HSV-based Storage Systems**

Component	Required	Remarks
Models	EVA3000 and/or EVA5000	
VCS	V2.006, V3.0, or V3.010	
SAN Connections	To the SMA and all BC hosts	Fibre Channel
Component	Supported	Not Supported
Maximum Number of Storage Systems	16 BC supports the maximum allowed by the combination of SMA, SMA software, and Device Manager.	

## BC Server/SMA Requirements and Support

Table 15 lists BC Server/SMA requirements and support.

**Table 15: BC Server/SMA Requirements and Support**

Component	Required	Remarks
BC Server	One (and only one) per BC network	See an HP authorized service provider or reseller for server licensing details.
SMA	<i>For EVAs:</i> v2.0, SP1a with CV EVA 3.0A or v2.1 with CV EVA 3.1  <i>For MA/EMAs:</i> v2.0, SP1a with HSG Element Manager 1.0E or v2.1 with HSG Element Manager 1.0F	
SAN Connection	To BC server and all BC host computers	Fibre Channel
LAN Connection	To all BC host computers	Compatible LAN adapter
Browser	At least one browsing computer	A browser is required to access BC GUI.

## Browser/JRE Requirements and Support

You can browse to the BC GUI from any computer with Enhanced OS support that has a valid network connection. A computer does not need to have a BC host agent installed to be able to browse to BC.

Because the BC graphical user interface uses Java™ applets, the browsing computer must have the required browser and Java 2 Runtime Environment (JRE). When first browsing to BC from a computer that does not have the required JRE, BC generates a warning message and prompts you to download the required JRE directly from BC. After the JRE is successfully installed, BC allows browsing to the BC GUI. JRE installation instructions are included in the BC Host Agent Installation Guides.

[Table 16](#) provides browser and JRE version requirements for each supported operating system.

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**Note:** For best viewing results, HP recommends browsing from a supported version of Internet Explorer with a supported JRE.

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**Table 16: Browser/JRE Requirements—For Enhanced OSs**

Operating Systems With Enhanced Support	Internet Explorer	Netscape	Other	Supported JREs
AIX 5.1.0.0 (5100-04) (64-bit) AIX 5.2.0.10 (5200-01) (64-bit)	Not supported	7.0.0.3	n/a	1.4.1_00 (32-bit)
HP-UX 11.11 (11iv1)	Not supported	7.0	n/a	1.4.1_02 (32-bit)
HP-UX 11.23 (11iv2)	Not supported	7.0	n/a	1.4.1_02 (64-bit)
OpenVMS V7.2-2 (64-bit) OpenVMS V7.3-1 (64-bit)	Not supported	Not supported	Secure Web Browser (SWB) 1.2-1	1.4.0_03
Solaris 8 <sup>1</sup>	Not supported	7.0	n/a	1.4.1_03 or 1.4.1_b21 (32-bit)

**Table 16: Browser/JRE Requirements—For Enhanced OSs (Continued)**

Operating Systems With Enhanced Support	Internet Explorer	Netscape	Other	Supported JREs
Solaris 9 <sup>2</sup> (64-bit only)	Not supported	7.0	n/a	1.4.1_03 or 1.4.1_b21 (64-bit)
Tru64 UNIX 5.1B, BL1	Not supported	6.2.3	n/a	1.4.1_02
Windows 2000 Advanced Server, SP3 or SP4	5.5 or 6.0 SP1 or later (IE 6.0.2800.1106 or later), 128-bit	Not supported	n/a	1.4.1_03 (32-bit)
Windows NT 4.0, SP6a	5.5 or 6.0 SP1 or later (IE 6.0.2600.0818529 or later), 128-bit	Not supported	n/a	1.4.1_03 (32-bit)
Windows Server 2003 Enterprise and Datacenter Edition (32-bit/IA32)	6.0 SP1 or later (IE 6.0.3790 or later)	Not supported		1.4.1_03 (32-bit)

1. See “[Browsing from Solaris 8 or 9 Computers](#)” on page 57 for special notes.
2. See “[Browsing from Solaris 8 or 9 Computers](#)” on page 57 for special notes.

For the latest basic OS support, check the following website: <http://h18000.www1.hp.com/products/storage/software/bizcopyeva/index.html>.

## Recommended Browser Settings

For BC menus to be fully viewable and accessible for input HP recommends the following settings:

- A minimum display resolution of 1024 x 768 pixels, with 256 or more colors
- Browser displayed at full screen size



## Maximum Number of Simultaneous Browser Connections

BC supports up to sixteen different users actively using the BC GUI at the same time. Increases beyond this number can lead to excessive SMA memory usage and can decrease overall GUI responsiveness.

## Browsing from Solaris 8 or 9 Computers

If you have a Solaris 8 or Solaris 9 computer, the supported JRE must be installed before you can browse to the BC GUI. When you install Netscape 7.0, the supported JRE (version 1.4.1\_03 or 1.4.1\_b21) will automatically be installed for you. You can also download the JRE from Sun Microsystems at: [http://java.sun.com/products/archive/j2se/1.4.1\\_03/index.html](http://java.sun.com/products/archive/j2se/1.4.1_03/index.html). For Solaris 9 computers, you must install the 32-bit JRE first, followed by the 64-bit JRE.

When running JRE 1.4.x series on the Solaris operating environment, behavior in conformance with the Java 2 platform specification is not guaranteed when using OpenWindows. In particular, some APIs related to handling focus, such as the `Component.requestFocus()` method, fail when using OpenWindows. This problem is due to a bug in OpenWindows. The bug does not exist in the CDE window manager.

## Host Agent Requirements and Support

This section specifies required and supported BC host agent components for each supported operating system. See an HP authorized service provider or reseller for server licensing details.

## Third-Party Applications

BC is compatible with a variety of third-party applications, including tape backup and database applications. Refer to the following URLs for more information:

- <http://h18000.www1.hp.com/products/storageworks/tapecompatibility.html>
- <http://h18000.www1.hp.com/storage/solutions/bcontinuity.html>

## AIX Requirements and Support

Table 17 specifies the required and supported components for AIX host computers.

**Table 17: AIX Host Computers**

Component	Required	
Operating System	AIX 5.1.0.0 (5100-04) or AIX 5.2.0.10 (5200-01)	
SAN Connection FCA or HBA (FCAs and HBAs must be running with Secure Path)	Cambex FibreQuik PC1000F adapters (HP part number: 197819-B21/DS-SWIA1-PD) with 2.01.38 firmware and 1.5.20.2 driver	
LAN Connection	Compatible LAN adapter	
HSG Solution Software kit	An AIX Solution Software kit that supports ACS 8.7-3	
HSV Solution Software kit	An AIX Solution Software kit that supports VCS V2.006, V3.0, or V3.010	
Secure Path	V2.0C or 2.0C with SP1	
Component	Supported	Not Supported
File System	AIX JFS	
LVM	LVM on AIX	
Cluster		X

## HP-UX Requirements and Support

Table 18 specifies the required and supported components for HP-UX host computers.

**Table 18: HP-UX Host Computers**

Component	Required	
Operating System	HP-UX 11.11 (11i v1) or 11.23 (11i v2) Itanium™ only	
SAN Connection FCA or HBA (FCAs and HBAs must be running with Secure Path)	HP PCI Tachlite Adapters A5158A or A6795A with 11.11.09 firmware and the latest driver	
LAN Connection	Compatible LAN adapter	
HSG Solution Software Kit	An HP-UX Solution Software kit that supports ACS 8.6-13 or 8.7-3	
HSV Solution Software Kit	An HP-UX Solution Software kit that supports VCS V2.006, V3.0, or V3.010	
Secure Path	V3.0C	
Component	Supported	Not Supported
File System	Hierarchical File System (HFS), VERITAS File System (VxFS)	
LVM	LVM on HP-UX	
Cluster	Not cluster-aware, but can exist in a host clustered environment that uses MC/Serviceguard for HP-UX 11.11 and 11.23.	
Language support	To use BC host agents with UNIX operating systems in non-English environments, set "LANG=C; export LANG" in the root profile.	

## OpenVMS Requirements and Support

[Table 19](#) specifies required and supported components for OpenVMS host computers.

**Table 19: OpenVMS Host Computers**

Component	Required	
Operating System	OpenVMS V7.2-2 (64-bit) with FIBRE_SCSI-V0500--4.PCSI Tima Kit* or OpenVMS V7.3-1 (64-bit) * This means you must apply the current mandatory ECO kits for the release, as well as the ES-class ECO kit. This includes the ECO kits (or successors) VMS721_CPU2208, VMS721_UPDATE, and VMS721_PCSI.	
SAN Connection FCA or HBA	Emulex LightPulse LP8000 adapters (HP part number: KGPSA) with 3.82a1 firmware and FIBRE_SCSI_V0500 driver Emulex LightPulse LP9002 (HP part number: 2354) with 3.82a1 firmware and FIBRE_SCSI_V0500 driver Emulex LightPulse LP9802 (HP part number: FCA2384) with 3.82a1 firmware and FIBRE_SCSI_V0500 driver	
LAN Connection	Compatible LAN adapter	
HSG Solution Software Kit	An OpenVMS Solution Software kit that supports ACS 8.6-13 or 8.7-3	
HSV Solution Software Kit	An OpenVMS Solution Software kit that supports VCS V2.006, V3.0, or V3.010	
Secure Path	Not applicable	
TCP/IP	V5.1 or greater	
Component	Supported	Not Supported
File System	Files-11 ODS-2	
LVM		X
Cluster	Not cluster-aware, but is supported on host clusters that use HP OpenVMS Cluster Systems. See <a href="#">"OpenVMS Clusters" on page 69</a> for cluster limitations and recommendations.	

## Solaris Requirements and Support

Table 20 specifies the required and supported components for Solaris host computers.

**Table 20: Solaris Host Computers**

Component	Required	
Operating System	Solaris 8 (32- or 64-bit) or Solaris 9 (64-bit)	
SAN Connection FCA or HBA (FCAs and HBAs must be running with Secure Path)	<p>Jaycor JN1 FC64-1063 (Solaris 8 only) (64-bit SBus) adapters (HP part number: 380575-001 / SWSA4-SB) with 3.0.3 firmware and 2.5.9-03 driver, or</p> <p>Jaycor JN1 FCI-1063 (Solaris 8 only) (32-bit PCI) adapters (HP part number: 123503-001 / DS-SWSA4-SC) with 13.3.7 firmware and 2.5.9-03 driver, or</p> <p>QLogic SANBlade 2300 Series (PCI) (HP part number: FCA2257P, part number 254456-B21 or 3R-A3513-AA) with 1.18.5 firmware and 3.1.2/4.11 driver, or</p> <p>QLogic SANBlade 2200 Series (Sbus) (HP part number: FCA2257S, part number 254458-B21 or 3R-A3514-AA) with 1.18.3 firmware and 2.2.1/4.11 driver, or</p> <p>QLogic SANBlade 2300 Series (cPCI) (HP part number: FCA2257C, part number 254457-B21 or 3R-A3512-AA) with 1.18.5 firmware and 3.1.2/4.11 driver</p>	
LAN Connection	Compatible LAN adapter	
HSG Solution Software Kit	A Solaris Solution Software kit that supports ACS 8.6-13 or 8.7-3	
HSV Solution Software Kit	A Solaris Solution Software kit that supports VCS V2.006, V3.0, or V3.010	
Secure Path	V3.0B with SP1 or V3.0C	
Component	Supported	Not Supported
File System	UFS	
LVM		X
Cluster		Not cluster-aware and is not supported on host clusters that use Sun Cluster
Language support	To use BC host agents with UNIX operating systems in non-English environments, set "LANG=C; export LANG" in the root profile.	

## Tru64 UNIX Requirements and Support

[Table 21](#) specifies the required and supported components for Tru64 UNIX host computers.

**Table 21: Tru64 UNIX Host Computers**

Component	Required	
Operating System	Tru64 UNIX 5.1B, BL1	
SAN Connection FCA or HBA	Emulex LightPulse LP8000 adapters (HP part number: 176479-B21/DS-KGPSA-CB) with 3.82a1 firmware, and 2.06 driver, or Emulex LightPulse LP9002 adapters (HP part number: FCA2354) with 3.82a1 firmware and 2.06 driver, or Emulex LightPulse LP9802 adapters (HP part number: FCA2384) 1.00x6 firmware and 2.06 driver	
LAN Connection	Compatible LAN adapter	
HSG Solution Software kit	A Tru64 UNIX Solution Software kit that supports ACS 8.7-3 NOTE: ACS 8.6x is not supported	
HSV Solution Software kit	A Tru64 UNIX Solution Software kit that supports VCS 2.006, 3.0, or 3.010	
Secure Path	Not applicable	
Component	Supported	Not Supported
File System	AdvFS, UFS	
LVM	LSM on Tru64 UNIX	
Cluster	Is cluster-aware using TruCluster for Tru64 UNIX 5.1b. See <a href="#">"Tru64 UNIX Clusters" on page 70</a> for cluster limitations and recommendations.	
Language Support	To use BC host agents with UNIX operating systems in non-English environments, set "LANG=C; export LANG" in the root profile.	

## Windows 2000 Requirements and Support

Table 22 specifies the required and supported components for Windows 2000 host computers.

**Table 22: Windows 2000 Host Computers**

Component	Required
Operating System	Windows 2000, SP3 or SP4 or Windows 2000 Advanced Server, SP3 or SP4
SAN Connection FCA or HBA (FCAs and HBAs must be running with Secure Path)	Emulex LightPulse LP8000 adapters (HP part number: 176479-B21/DS-KGPSA-CB) with 3.91a1 firmware, and 4.82a16 driver, or Emulex LightPulse LP952 adapters (HP part number: FCA2101) with 3.91a1 firmware, 4.82a16 Emulex LightPulse LP9002DC (HP part number: FCA2355) with 3.91a1 firmware, and 4.82a16 driver Emulex LightPulse LP9802 adapters (HP part number: FCA2404) with 1.01a2 firmware, and 4.82a16 driver, or Emulex LightPulse LP9802DC adapters (HP part number: FCA2404DC) with 1.01a2 firmware, and 4.82a16 driver, or Emulex LightPulse LP982 adapters (HP part number: FCA2408) with 1.01a2 firmware, and 4.82a16 driver, or Qlogic SANblade QLA2340 adapters (HP part number: FCA2214) with 1.34 (BIOS) firmware and 8.2.0.72 driver, or Qlogic SANblade QLA2342 adapters (HP part number: FCA2214DC) with 1.34 (BIOS) firmware and 8.2.0.72 driver, or Qlogic Smart Component BL20p adapters (HP part number: FCA2214) with 1.34 (BIOS) firmware and 8.2.0.73 driver, or Qlogic Smart Component BL20p adapters (HP part number: FCA2214DC) with 1.34 (BIOS) firmware and 8.2.0.73 driver
LAN Connection	Compatible LAN adapter
HSG Solution Software Kit	A Windows Solution Software kit that supports ACS 8.6-13 or 8.7-3



**Table 22: Windows 2000 Host Computers (Continued)**

HSV Solution Software Kit	A Windows Solution Software kit that supports VCS V2.006, V3.0, or V3.010	
Secure Path	V4.0B or V4.0C for Windows 2000	
Component	Supported	Not Supported
File System	NTFS	
LVM		X
Cluster	Not cluster-aware, but is supported on host clusters that use Microsoft Cluster Service (MSCS) for Windows 2000 Advanced Server. See <a href="#">“Windows 2000/NT/2003 Clusters” on page 70</a> for cluster limitations and recommendations.	

## Windows NT Requirements and Support

Table 23 specifies the required and supported components for Windows NT host computers.

**Table 23: Windows NT Host Computers**

Component	Required	
Operating System	Windows NT Server 4.0, Enterprise Edition with SP6a	
SAN Connection FCA or HBA (FCAs and HBAs must be running with Secure Path)	Emulex LightPulse LP8000 adapters (HP part number: KGPSA) with 3.91a1 firmware, and 4.82a16 driver, or Emulex LightPulse LP952 adapters (HP part number: FCA2101) with 3.91a1 firmware, and 4.82a16	
LAN Connection	Compatible LAN adapter	
HSG Solution Software Kit	A Windows Solution Software kit that supports ACS 8.6-13 or 8.7-3	
HSV Solution Software Kit	A Windows Solution Software kit that supports VCS V2.006, V3.0, or V3.010	
Secure Path	V4.0B or V4.0C for Windows NT	
Component	Supported	Not Supported
File System	NTFS	
LVM		X
Cluster	Not cluster-aware, but is supported on host clusters that use MSCS for Windows NT 4.0 Enterprise Edition 1.0. See <a href="#">"Windows 2000/NT/2003 Clusters"</a> on page 70 for cluster limitations and recommendations.	

## Windows Server 2003 Requirements and Support

Table 24 specifies the required and supported components for Windows Server 2003 host computers.

**Table 24: Windows Server 2003 Host Computers**

Component	Required
Operating system	Windows Server 2003 Enterprise Edition (32- or 64-bit) or Windows Server 2003 Datacenter Edition (64-bit)
SAN connection FCA or HBA (FCAs and HBAs must be running with Secure Path)	<p><b>For 32-bit:</b></p> <p>Emulex LightPulse LP8000 adapters (HP part number: 176479-B21/DS-KGPSA-CB) with 3.91a1 firmware, and 4.82a16 driver, or</p> <p>Emulex LightPulse LP952 adapters (HP part number: FCA2101) with 3.91a1 firmware, and 4.82a16 driver, or</p> <p>Emulex LightPulse LP9002DC (HP part number: FCA2355) with 3.91a1 firmware, and 4.82a16 driver</p> <p>Emulex LightPulse LP9802 adapters (HP part number: FCA2404) with 1.01a1 firmware, and 4.82a16 driver, or</p> <p>Emulex LightPulse LP9802DC adapters (HP part number: FCA2404DC) with 1.01a1 firmware, and 4.82a16 driver, or</p> <p>Emulex LightPulse LP982 adapters (HP part number: FCA2408) with 1.01a1 firmware, and 4.82a16 driver, or</p> <p>Qlogic SANblade QLA2340 adapters (HP part number: FCA2214) with 1.34 (BIOS) firmware and 8.2.0.72 driver, or</p> <p>Qlogic SANblade QLA2342 adapters (HP part number: FCA2214DC) with 1.34 (BIOS) firmware and 8.2.0.72 driver, or</p> <p>Qlogic Smart Component BL20p adapters (HP part number: FCA2214) with 1.34 (BIOS) firmware and 8.2.0.73 driver, or</p> <p>Qlogic Smart Component BL20p adapters (HP part number: FCA2214DC) with 1.34 (BIOS) firmware and 8.2.0.73 driver, or</p> <p><b>For 64-bit:</b></p> <p>Emulex LightPulse <b>LP9802</b> adapters (HP part number: FCA2404) with 1.01a1 firmware, and 5.00a11 driver</p>
LAN connection	Compatible LAN adapter

**Table 24: Windows Server 2003 Host Computers (Continued)**

HSG Solution Software kit	A Windows Solution Software kit that supports ACS 8.6-13 or 8.7-3	
HSV Solution Software kit	A Windows Solution Software kit that supports VCS V2.006, V3.0, or V3.010	
Secure Path	V4.0C for Windows Server 2003	
Component	Supported	Not Supported
File System	NTFS	X
LVM		X
Cluster	Not cluster-aware, but is supported on host clusters that use MSCS for Windows Server 2003, Enterprise Edition. See <a href="#">“Windows 2000/NT/2003 Clusters” on page 70</a> for cluster limitations and recommendations.	

## Cluster Limitations and Recommendations

This section describes OS-specific cluster limitations and support.

### OpenVMS Clusters

Note the following about using clusters with OpenVMS:

- The cluster must have a cluster IP address, and it must be defined within TCP/IP.
- One of the nodes in the cluster is automatically assigned the role of cluster impersonator. BC will install only on the node that is acting as the cluster impersonator. If this node fails or shuts down, the BC host agent will not function until that node is returned to service and has regained the cluster impersonator role.

To determine the cluster impersonator, use the following commands:

```
$ mcr sysman
SYSMAN> set environment/cluster
SYSMAN> do ucx show interface/cluster
```

- Volume Sets must be mounted cluster-wide to be snappable/cloneable by BC. BC does not support performing jobs on Volume Sets that are not mounted cluster-wide.
- A Volume Set can be replicated/mounted back to the same host/cluster as the source disk, but the Volume Set will be mounted process-wide only. Volume Sets replicated/mounted to a different host/cluster as the source host/cluster will default to a system-wide mount unless a Volume Set with the same name exists already. In this case, the replicated Volume Set will be mounted process-wide.
- The name/mount point of replicated Volume Sets cannot be changed. HP recommends using the default volume set name that appears in the drop-down menu when editing the MOUNT operation.

## Tru64 UNIX Clusters

Note the following about using clusters with Tru64 UNIX:

- If the node running the BC host agent fails during the execution of a job, that job will fail. Undoing and re-executing the job should cause it to succeed.
- A BCV presented by BC is visible to all nodes in the cluster as long as one of the first two nodes (listed as active at the time the job was run) remains active.
- Host agent software is installed to the cluster and resides on a share drive that is visible to each node.

## Windows 2000/NT/2003 Clusters

Note the following about using clusters in a Windows environment:

- HP recommends that the host agent be installed on each node in the cluster.
- When the BC host agent is present on a cluster, BC jobs can mount BCVs of noncluster volumes to individual clustered nodes (active or inactive).  
  
BCVs of cluster volumes can be mounted to all nodes of the cluster, with the exception of the quorum disk (once mounted, the BCV is visible only to the node on which it is mounted). HP does not support placing BCVs into the cluster as resource disks.
- A node becomes unavailable for job operations when the node running the BC host agent fails.
- If you are creating a BCV of the cluster quorum disk, do not mount the BCV on a member of the same cluster.
- Host cluster support should be installed only on MSCS cluster nodes. Enabling this feature on nonclustered systems may cause undesirable side-effects. Host cluster support should be enabled on all nodes of the cluster.
- SUSPEND and RESUME operations can be performed on the cluster, but MOUNT and volume style replication operations must be performed against the individual cluster members.
- Cluster volumes must use default names. Using Cluster Administrator to assign nondefault names to cluster volumes prevents BC from mapping the cluster volumes to respective storage systems. BC fails volume style replication jobs created against clustered volumes that use nondefault names.

# Starting and Browsing to BC

## 5

This chapter describes the tasks for starting and browsing to BC. If you have a new BC network, follow the procedures in the order listed below. Topics include:

- [Changing the SMA Password](#), page 72
- [Setting Up the Browser](#), page 73
- [Browsing to the BC GUI](#), page 75

## Changing the SMA Password

For security, HP recommends changing the default user name and password for the administrator account immediately upon browsing to the SMA for the first time.

Note the following:

- On the SMA Account Login page, the default user name is the account name and the password is set to *anonymous*.
- The default administrator account name provides permissions of the highest level of access.

To change the default administrator password and account:

1. Log in to the SMA as the administrator.
2. Create a new password for the administrator account or change a password for an existing account.

For instructions on logging in to the SMA for the first time or establishing accounts and passwords, refer to the SMA software documentation.



## Setting Up the Browser

This section describes the recommended browsing options for Microsoft Internet Explorer and Netscape browsers. See “[Browser/JRE Requirements and Support](#)” on page 55 for supported browser versions.

### Verify Stored Pages Option

The stored pages option on your browser is used to prevent caching so you will always view updated pages in the BC GUI. Follow the instructions for your browser.

*For Internet  
Explorer  
Browsers*

1. From the Desktop or **Start** menu, start a browser.
2. Choose **Tools > Internet Options**.
3. From the **General** tab, under **Temporary Internet files**, click **Settings**.
4. Under **Check for newer versions of stored pages**, select **Every visit to the page**.

*For Netscape  
Browsers*

1. Choose **Edit > Preferences**.
2. In the navigation pane, choose **Advanced > Cache**.
3. On the **Set Cache Options** page, under **Compare the page in the cache to the page on the network**, choose **Every time I view the page**.

### Set Font Size—Only UNIX with Netscape

For Netscape browsers, HP recommends a font-size setting. The default font settings for the Netscape browser running on a UNIX-based operating system can cause graphical elements to be displayed incorrectly. For better viewing, choose a 12-point or larger font size for the fixed-width (or monospace) and variable-width (or proportional) font selections. Direct the browser to use application or document-specified fonts (including Dynamic Fonts); depending on version, you may need to direct the browser to “allow documents to use other fonts.”

---

**Note:** Depending on the browser version in use, the following text may differ.

---

To access the font settings, open the browser and choose **Edit > Preferences > Appearance > Fonts**.

## Verify Screen Resolution

For BC menus to be fully viewable and accessible for input, HP recommends the following settings:

- A minimum display resolution of 1024 x 768 pixels
- The browser displayed at full screen size

## Browsing to the BC GUI

To browse to the BC GUI, the following is required:

- The SMA that supports the BC network must be operating
- The BC server service must be running
- A supported browser and JRE must be installed

---

**Note:** Browsing to the BC GUI from the SMA using the locally installed browser is not supported. This includes running the SMA browser via a Terminal Services session.

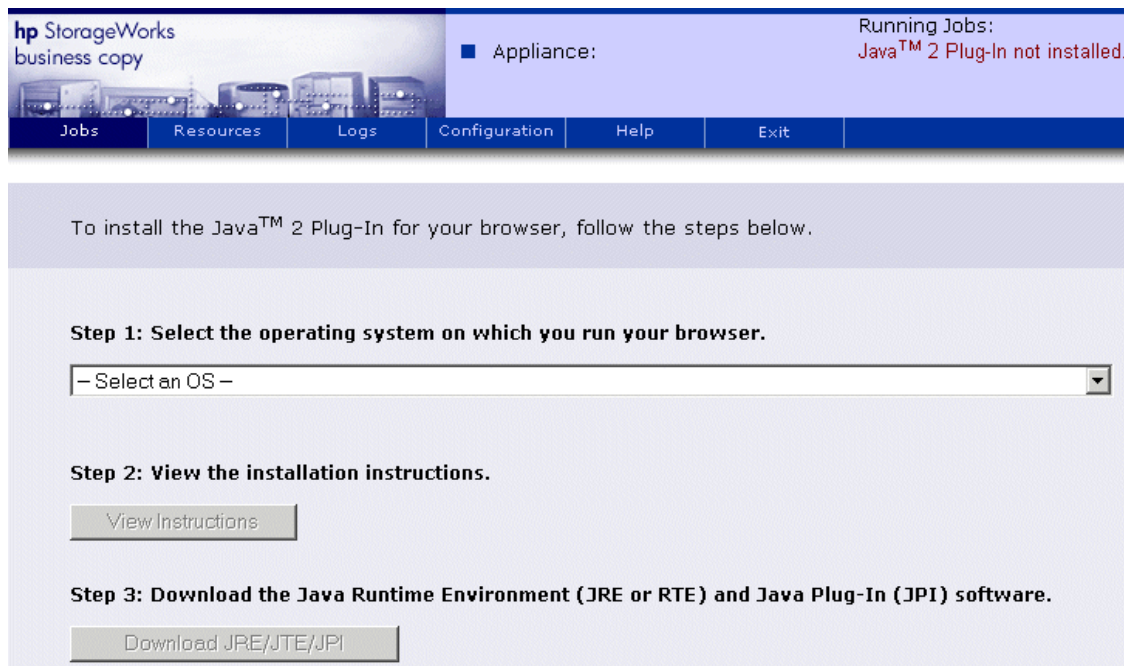
---

Follow these steps to browse to the BC GUI:

1. Verify that you have installed a supported browser and JRE by reviewing the table on page 55 ([Browser/JRE Requirements and Support](#)).
2. If you have a supported browser and JRE, go to [step 3](#).

If you do not have a supported browser and JRE:

- a. Install a supported browser.
- b. Install a supported JRE by accessing the JRE Download page:  
`http://<SMA Name or IP Address>:<port number>/appvolcpqevm/html/jreDownload.html` (see [Figure 8](#)).



**Figure 8: JRE download page**

- c. Follow the onscreen instructions to download a supported JRE.
  - d. Manually download the JRE from the SMA directory: `..\\Program Files\\Compaq\\SANworks\\Enterprise Volume Manager\\html\\jreDownloads` and save it to a local drive.
  - e. Install the JRE, using the installation instructions.
  - f. Close all open instances of the browser, to ensure that the JRE loaded properly.
3. Log in to the SMA.
  4. Click **Tools**.
  5. Click **business copy**.

If you get the message,

Java 2 plug-in necessary to run this applet has not been installed. Click here to download the plug-in.

it means that BC detected that you do not have a supported JRE installed. Follow the onscreen instructions. If you cannot complete the installation for any reason, go back to [step 2b](#) of this procedure.

6. In the BC GUI, select the Resources tab.

In the left pane, check the following:

- Are host agent computers visible? If not, see “[Host Agents Not Displaying](#)” on page 128.
- Are storage systems visible? If not, check the element manager/device manager display to verify that the storage system is being presented to BC. Also, make sure that storage systems are zoned for the appropriate SMA.
- If you have HSV-based storage systems, are they visible? If not, have you recently changed passwords on the SMA Account Login screen and not updated passwords on BC utilities? If yes, see “[Synchronizing Passwords—HSV-based Storage Only](#)” page 98.

Now that you can access BC, you can create jobs. Refer to the Online Help & User Guide for information on planning and creating jobs.



# Preparing to Update a BC Network



This chapter describes the high-level tasks for preparing to update a BC 2.x network. Topics include:

- [Update Steps](#), page 80
- [BC Kit and Update History](#), page 82

## Update Steps

This section contains steps for updating from EVM V2.0/A/B/C/D or BC 2.1/2.1a to BC v2.2. All update software is available from the BC software updates page website: <http://h18000.www1.hp.com/products/storage/software/bizcopyeva/index.html>.

Follow these steps for updating.

1. Purchase BC 2.2. software.
2. Check Release Notes for last-minute changes to requirements, support, and problems that may affect your update.
3. Review update requirements.

Before updating, you should consider the ramifications of updating to a new version. While a new version will include valuable new features, it may also introduce limitations of which you should be aware. Go to [Chapter 4, “BC Requirements and Support”](#) and check the following tables for requirements:

- Storage Systems, “[Storage Systems Requirements and Support](#)” on page 52
- BC Server, “[BC Server/SMA Requirements and Support](#)” on page 54
- Host Agents, “[Host Agent Requirements and Support](#)” on page 58

4. Use the Configuration Worksheets ([Appendix A](#)) to plan your update.
5. Schedule the update.

Before updating, make sure BC jobs are not running or undoing, or are scheduled to run/undo during the update.

6. Update storage systems if necessary.
7. Update the SMA if necessary.
8. Verify that storage systems are visible on the SMA.
9. Update the server using the documentation from the BC product page.
  - a. Update the EVM V2.0x to V2.1 or BC v2.1a, using BC 2.1 or BC v2.1a update software.
  - b. Update BC 2.1 or BC v2.1a to BC v2.2, using BC v2.2 update software.

*For EVM  
V2.0/A/B/C  
/D*

*BC 2.1/2.1a*

Update BC 2.1 or BC 2.1a to BC 2.2, using BC v2.2 update software.



10. Back up the update files or make CD-ROMs.

This ensures that BC installations and updates can be performed quickly in the future without downloading files again.

11. Browse to the BC GUI Resources page and verify that the expected storage systems are shown.
12. Update host computer software if necessary: OS version, FCA/HBA, HSG/HSV Solution Software, and Secure Path.
13. Update all host agent computers in the EVM or BC network to BC 2.2, using BC Host Agent v2.2 update software.
14. Back up the update file or make a CD-ROM to ensure easy installation and updates in the future.
15. Browse to the BC GUI and verify that hosts and volumes are visible on the Resources page.

## BC Kit and Update History

Table 25 shows the history of BC kit and update releases.

**Table 25: Business Copy Kit and Update History**

Release	Server Version	Host Agents Included
October 2001 Kit	EVM V2.0	EVM V2.0 for Windows 2000/NT
December 2001 Update	EVM V2.0A <sup>1</sup>	EVM V2.0A for AIX
January 2002 Update	EVM V2.0B <sup>1</sup>	EVM V2.0A for AIX EVM V2.0B for Solaris
April 2002 Update	EVM V2.0C <sup>1</sup>	EVM V2.0A for AIX EVM V2.0B for Solaris EVM V2.0C for Compaq Tru64 UNIX, HP-UX, and Windows 2000/NT <sup>2</sup>
August 2002 Update	EVM V2.0D <sup>1</sup>	EVM V2.0D for Tru64 UNIX, HP-UX, AIX, Solaris, and Windows 2000/NT
August 2002 Kit	EVM V2.0D	EVM V2.0D for Tru64 UNIX, HP-UX, AIX, Solaris, and Windows 2000/NT
March 2003 Kit	BC v2.1a	BC v2.1a for Tru64 UNIX, HP-UX, AIX, Sun Solaris, and Windows2000/NT
March 2003 Update	BC v2.1a <sup>3</sup>	BC v2.1a for Tru64 UNIX, HP-UX, AIX, Sun Solaris, and Windows 2000/NT
May 2003 Update	BC v2.1a	BC v2.1a for Tru64 UNIX, HP-UX, AIX, Sun Solaris, and Windows Server2003/2000/NT/2003
October 2003 Update	BC v2.2	BC v2.2 for Tru64 UNIX, HP-UX, AIX, Solaris, and Windows Server 2003/2000/NT/2003, and OpenVMS.

1. Requires an initial installation of EVM Server V2.0.
2. Requires an initial installation of EVM Host Agent V2.0 for Windows 2000/NT.
3. Requires a current installation of the BC Server, either V2.0C or V2.0D, depending on your SMA software version.

# Best Practices and Maintenance Tasks



This chapter describes best practices and maintenance tasks that you may need to perform. Topics include:

- [Best Practices](#), page 84
- [Maintenance Tasks](#), page 91

## Best Practices

This section describes best practices for running a BC network. Topics include:

- [Avoiding Browser Session Timeout](#), page 84
- [Saving Jobs and Configurations](#), page 84
- [Avoiding SMA Automatic Restart](#), page 85
- [Optimizing Performance](#), page 86

### Avoiding Browser Session Timeout

In the BC GUI, the browser session will time out after 15 minutes of inactivity. At that point, you'll have to log in again. Therefore, when creating jobs or making changes on the Configuration page where an explicit Save is required, make sure you are saving often. Under certain circumstances, the SMA software expiration may also reset the connection between the browser and the BC GUI. If the Running Jobs window displays the message, `Refresh Browser`, the connection has been reset and any information not saved before the reset will be lost.

### Saving Jobs and Configurations

BC stores job files and critical configuration data on the SMA. HP recommends saving this information to a host computer on a continual basis, either periodically or whenever a BC job is created, modified, or deleted. Being able to reload the BC configuration after an SMA or BC server failure can prevent re-creating BC jobs and reinstalling the BC host agents.

To save BC jobs and configuration information, use the BC Configuration Save/Reload feature in the BC GUI. Typically, saving the configuration requires less than 1 MB of storage. In extreme cases, the amount of storage required might exceed a few megabytes.

After a configuration is saved, the Reload feature can be used to download this information from the host computer to the SMA. Because a Reload is primarily required following a failure, some manual cleanup is expected. In particular, any BC job that was running at the time of the failure must be reviewed, cleaned up, and rerun. Note the following:

- When a saved BC configuration is reloaded, the job-state information is lost. The job state defines the current operational status of the job (idle, running, complete, or undo complete). If state information is lost, the ability to undo a

complete or partially complete job is lost. If this occurs, manually remove all mounted BCVs and modify the storage configuration to return this configuration to its original state.

- Restoring the storage configuration to its original state can be accomplished either manually, by using a configuration worksheet that describes the details of each unit on the storage system, or automatically, with the features built into the array controller. ACS documentation includes a configuration worksheet that can be used for manual restoration and also gives detailed information on how to use the automatic restoration feature.

## Avoiding SMA Automatic Restart

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**Note:** The following information applies *only* if you've updated from OSM V1.0C to SMA v2.0.

---

The SMA is configured to automatically restart the core appliance services (not including BC) at a default time of 3:00 AM every Sunday. One of the services restarted is the HSG Element Manager, which BC depends on for communication access to the storage hardware. When BC detects a restart of the HSG Element Manager service, BC automatically enters an idle state until the HSG Element Manager service returns. If a BC job is running when this service restart occurs, the BC job may fail.

To prevent this type of failure, do one of the following:

- Schedule all BC jobs so that they complete before the automatic restart time.
- Start all BC jobs after the automatic restart time.
- Change the time of the SMA resynchronization to avoid jobs that are running.

Refer to the SMA documentation for more information.

## Optimizing Performance

BC performance depends on several factors, including the number of jobs running, the number of steps and complexity of the jobs, and I/O activity on the storage systems and hosts. [Table 26](#) lists some of the factors that can help you increase performance.

**Table 26: Optimizing Performance**

Problem	Description	Resolution
Slow BC server response	BC supports eight simultaneous jobs. Even though job execution takes place in parallel, some job operations must be done serially (such as storage and BC host agent access). This imposes practical limits on the number of jobs that can be run simultaneously. If you are running more than eight jobs, the BC server becomes less responsive to new requests and performance starts to be impacted.  In a single job, you can access up to eight different HSG-based storage systems or two different HSV-based storage systems.	Review how you're scheduling jobs and find a way to load balance so too many jobs are not running at the same time.  Ensure that unique storage and host resources are specified for any jobs that must be run simultaneously.
	Excessive memory consumption causes a gradual decrease in BC performance.	BC performs a periodic internal update procedure that helps prevent excessive memory usage and ensures optimal performance. To prevent this process from impacting the BC job execution, BC does not perform this procedure while a BC job is currently running. In extremely busy configurations, a BC job may be running at all times and the update procedure never runs. In this case, BC memory consumption continues to increase gradually over time, causing a general decrease in BC performance.

**Table 26: Optimizing Performance (Continued)**

Problem	Description	Resolution
Slow BC server response	Excessive memory consumption causes a gradual decrease in BC performance.	To prevent excessive memory consumption, make sure that BC has at least 30 seconds of inactivity (where no jobs are running), at least twice a day, to allow the update procedure to run.
Slow BC GUI and job performance	More than 16 users can result in excessive SMA memory usage and can decrease overall GUI performance.	Decrease number of users accessing BC at the same time.
	Using more than 25 HSG-based storage systems and more than 16 HSV-based storage systems can affect BC GUI and job performance.	Follow storage requirements described in <a href="#">"Storage Systems Requirements and Support"</a> on page 52.
	Large BCVs on busy storage systems can take several hours to delete.	Schedule deletes appropriately.
	The GUI is slow to respond to requests when creating and editing jobs.	The responsiveness of the BC GUI depends on the number of currently running jobs and the size of the configuration (storage and host agents). To reduce long response times, perform all job creation and maintenance operations at a time when no BC jobs are running.
	Using volume groups can affect BC jobs.	The fewer the physical volumes (units) that comprise a volume group or domain, the faster and more efficient the BC job becomes.

**Table 26: Optimizing Performance (Continued)**

Problem	Description	Resolution
	AIX parameter: UNMOUNTVGSOURCE	<p>BC jobs generally execute more quickly when the UNMOUNTVGSOURCE parameter is set to 'false' because the jobs will not unmount affected mount points, nor perform any volume group exports. However, this method does not guarantee data integrity or availability, because mount points and volume groups remain active during the creation of the point-in-time copy.</p> <p>The default setting after installation of the host agent software is 'false.' You can edit the setting in: <i>/usr/opt/CPQevm/bin/OSVM.ini</i></p>
	Job operation sequence for remounting a BCV can affect performance	<p>If you are replicating storage, mounting it on a host, and remounting it somewhere else, you may have used a sequence of operations that is not optimal. If you use the following sequence, the MOUNT operation can take a long time, and consequently your application may be suspended for a long time.</p> <p>SUSPEND SNAP MOUNT SNAP RESUME MOUNT</p> <p>To avoid staying in the 'suspended' state any longer than necessary, use the following sequence of operations:</p> <p>SUSPEND SNAP SNAP RESUME MOUNT MOUNT</p>



## BC GUI Performance Features

The following sections describe features in the BC GUI that can affect performance. For detailed information, refer to the Online Help & User Guide.

### Available Storage Systems

BC compiles a list of available storage by querying every StorageWorks HSG- and HSV-based storage system in the SAN during startup, and again at each periodic storage refresh. The more storage systems involved, the longer the refresh takes to complete.

For HSV-based storage systems, BC lets you selectively filter out those storage systems not needed for BC jobs by using the BC GUI option, **Configuration > HSV Options**. When storage systems are made unavailable to BC, the startup and storage refreshes complete more quickly.

### Storage System Refresh Interval

Successful BC job execution depends on BC having up-to-date storage information; periodic refreshes are critical. The following are factors to be considered in establishing the refresh rate:

- If the storage configuration changes (for example, through the creation of a new unit or the deletion of an existing unit), BC will not know about the change until a storage refresh occurs. Meanwhile, BC jobs may fail as a result of using out-of-date storage information.
- Refreshes are resource-intensive operations and, in extreme cases, can take as long as five minutes per storage system to complete. So, choosing an appropriate value for the refresh rate—one that balances performance with the need for current information—is an important part of managing a BC network.
- In stable environments where the storage configuration does not change frequently, a longer refresh period ensures better performance. In environments where storage changes frequently, a shorter refresh interval may be required.
- Refresh rate is also dependent on the workload of the HSG and Command View EVAs. If, for example, the element manager is in the process of doing a resource-intensive function, it will be less responsive and BC discovery will be slower.

- By default, BC refreshes the storage configuration information displayed by the GUI every 6 hours (360 minutes). This is advantageous for large configurations. You can adjust this rate, but the GUI will not let you refresh at a rate that is less than 5 minutes times the number of storage systems. For example, a configuration with 10 storage systems would have the minimum refresh rate of every 50 minutes.

For complete details on refresh intervals and jobs, refer to Online Help & User Guide and choose **Network Planning > Device Discovery Planning**.

## Maintenance Tasks

This section describes tasks you may need to perform after the BC network is up and running. Topics include:

- [Adding/Removing a Computer to a BC Network](#), page 91
- [Removing a BC Network](#), page 92
- [Controlling BC Services and Daemons](#), page 93
- [Renaming and Replacing an SMA](#), page 95
- [Migrating HSG Jobs to HSV-based Storage Systems](#), page 97
- [Synchronizing Passwords—HSV-based Storage Only](#), page 98
- [Adding HSV Storage](#), page 99

### Adding/Removing a Computer to a BC Network

Consider the following when adding BC host agent software to a host computer in a BC network:

- Each new host computer must be connected to an SMA using the SMA's fully-qualified name or IP address.
- Before installing the BC host agent software, make sure the new host computer is communicating with the SMA.
- The BC server software should be running when you add BC host agent software so it can validate the existence of the new host computer. If the LAN is down or offline, BC host agent software can still be installed, but you must manually verify the connection between the BC server and the new host computer later.

Use [Table 27](#) to understand ramifications of removing BC host agent software from a host computer.



**Caution:** If not properly planned, removing BC host agent software from a host computer can result in reduced operational capabilities and loss of data.

---

**Table 27: Removing BC Host Agents**

If You...	Then...	Therefore, You Should...
Stop the host agent service or daemon	All BC jobs associated with the host will be halted	<ul style="list-style-type: none"><li>■ Make sure all jobs associated with the host computer are in one of the following states: any Idle state, Invalid, or Undo Complete.</li><li>■ Modify jobs to point to a new host agent (if applicable).</li><li>■ Delete jobs no longer in use (if applicable).</li></ul>
Remove the host agent from a host computer	The host agent icon will still be visible on the Resources page in the BC GUI	Consider using the Delete Host function on the Resources page in the BC GUI to prevent the host from showing up in the Resources page whenever the BC server is rebooted.

## Removing a BC Network

To remove a BC network, follow these procedures.

1. In the BC GUI, make sure all BC jobs associated with the BC network have completed and are in any Idle, Invalid, or Undo Complete state.
2. Use the **Configuration > Save/Reload** feature in the BC GUI if you want to save jobs and configuration information to another computer.
3. Remove the BC host agent software from all host computers in the BC network.
4. Remove the BC server from the SMA.

## Controlling BC Services and Daemons

This section describes procedures for starting and stopping services/daemons for the BC Server and host agents.

### Starting/Stopping the BC Server

During installation, the BC server is installed as a Windows service on the SMA. The BC server service starts automatically following installation. The BC server must be kept running to create, run, monitor, or manage BC jobs.



**Caution:** Do not stop the BC server unless the BC network is intentionally being shut down. Stopping the BC server also shuts down the associated BC network. Any BC job that is running on the BC network will stop, and no BC job can be run until the BC server is started again.

---

To start or stop the BC server service:

1. Select **Home > Settings > Manage Tools > Business Copy**.
2. Click **Start** or **Stop**.

### Starting/Stopping Host Agents

BC host agents are installed as either a Windows service for the Windows operating system, or as a daemon for UNIX operating systems. The BC host agent service or daemon is automatically started by default at the end of the installation process. Restarting a host agent computer automatically starts the BC host agent service.

The BC host agent must be running to allow a computer to participate in BC jobs.



**Caution:** Do not stop a BC host agent that is participating in BC jobs. Stopping the BC host agent service or daemon on a host computer prevents that computer from participating in BC jobs.

---

*For Windows hosts* To start or stop the BC service or daemon for a host agent computer:

1. Open the Windows Services window:
  - For Windows 2000, choose **Start > Settings > Control Panel > Administrative Tools > Services**.
  - For Windows NT/2003, choose **Start > Settings > Control Panel > Services**.
2. Choose **Switchboard**.
3. To stop the service, click **Stop**; to restart the service, click **Start**.

*For UNIX hosts* The following procedure requires root permissions.

To start or stop the BC service or daemon for a host agent computer:

1. Open a terminal window and log in as a superuser or root.
2. Change the working directory as follows:
  - For AIX: `/usr/opt/CPQevm/bin`
  - For HP-UX: `/opt/CPQevm/bin`
  - For Solaris: `/opt/CPQevm/bin`
  - For Tru64 UNIX: `/usr/opt/CPQevm/bin`
3. Start or stop the daemon as follows:
  - AIX:
    - Stop: `evmshutdwn`
    - Start: `entrprsvolmgr`
  - HP-UX:
    - Stop: `/sbin/rc2.d/K890entrprsvolmgr stop`
    - Start: `/sbin/rc2.d/S890entrprsvolmgr start`
  - Solaris:
    - Stop: `/etc/rc2.d/K89entrprsvolmgr stop`
    - Start: `/etc/rc3.d/S89entrprsvolmgr start`
  - Tru64 UNIX:
    - Stop: `/sbin/rc2.d/K89entrprsvolmgr stop`
    - Start: `/sbin/rc3.d/S89entrprsvolmgr start`

*For Other Hosts* The following procedure requires system privileges:

- OpenVMS:
  - Stop: @sys\$startup:bc\$shutdown.com
  - Start: @sys\$startup:bcstartup.com

## Starting/Stopping SMA Utilities

When doing maintenance tasks on the SMA, such as using the Backup/Restore Appliance utilities, the BC server must be restarted. If you do not restart the BC server, you may find missing storage in the BC GUI, and eventually jobs could be affected.

Whenever the BC server is restarted, you should make sure no jobs are running or are scheduled to run during this time.

## Renaming and Replacing an SMA

Renaming and replacing an SMA has implications and procedures that must be followed to ensure BC operability. Use [Table 28](#) to determine the procedures to follow in this section.

**Table 28: Replacing and Renaming SMAs**

If You Are...	Go to...
Replacing an existing SMA	<a href="#">Replacing an SMA</a> on page 95
Renaming an SMA <b>before</b> your BC network is up and running with a BC server and host agents	<a href="#">Renaming SMAs—Before a BC Network is Established</a> on page 96
Renaming an SMA <b>after</b> your BC network is up and running with a BC server and host agents	<a href="#">Renaming SMAs—After a BC Network is Established</a> on page 96

## Replacing an SMA

Follow these procedures for replacing an SMA. The procedures assume that you are renaming the SMA using *the current SMA name*; if you are renaming the SMA to a new or different SMA name, follow instructions in “[Renaming SMAs—After a BC Network is Established](#)” on page 96.

1. Back up your BC server configuration and job files using the **Configuration > Save** option in the BC GUI.

2. Rename the SMA using the *current SMA name*. Renaming instructions are detailed in the respective documents for each SMA:
  - For Storage Management Appliance software v2.0, refer to the *HP OpenView Storage Management Appliance User Guide*.
  - For Open SAN Manager V1.0C, refer to the *SANworks by Compaq Open SAN Manager User Guide*.
3. Reload your BC server configuration and job files using the **Configuration > Reload** option in the BC GUI.

## Renaming SMAs—Before a BC Network is Established

If you are initially setting up a BC network (where the BC server and host agents are not yet installed), renaming SMAs is recommended.

Changing them now will:

- Avoid uninstalling and reinstalling of BC and other software if an SMA fails after a BC network is established.
- Provide more recognizable, user-friendly names for SMAs.

Follow instructions for renaming an SMA based on your software:

- For Storage Management Appliance software v2.0, refer to the *HP OpenView Storage Management Appliance User Guide*.
- For Open SAN Manager V1.0C, refer to the *SANworks by Compaq Open SAN Manager User Guide*.

## Renaming SMAs—After a BC Network is Established

HP does not recommend renaming SMAs after a BC network is established because it requires uninstalling BC (and possibly other value-added software) and updating host agents; for large networks, the renaming procedure can be time consuming.

If you choose to rename, follow these instructions:

1. Make sure there are no currently running jobs on the SMAs involved. (Jobs must be in one of the following states: Invalid, any Idle state, or Undo Complete.)
2. Back up your BC server configuration and job files using the **Configuration > Save** option in the BC GUI.



3. Uninstall BC (and other software as determined by your SMA software) and rename the SMAs.

You can determine the list of software to remove by logging into your SMA, and following the SMA rename procedure. The software will stop you from renaming the SMA and dynamically provide the list of software to remove before proceeding with the rename.

For instructions on renaming, refer to the appropriate document:

- For Storage Management Appliance software v2.0, refer to the *HP OpenView Storage Management Appliance User Guide*.
  - For Open SAN Manager V1.0C, refer to the *SANworks by Compaq Open SAN Manager User Guide*.
4. Reload the BC server configuration and job files using the **Configuration > Reload** option in the BC GUI.
  5. Update the appropriate host agents to make them aware of the new SMA names by either reinstalling the host agents or updating the *sb.ini* file on each host agent using the following procedure:
    - a. Stop the BC service on the host agent.
    - b. Use File Manager and navigate to *C:\Program Files\Compaq\SANworks\Enterprise Volume Manager\bin*
    - c. Open the *sb.ini* file in a text editor.
    - d. Under the Switchboard column header, locate the line:  
`Appl_name : <name>`
    - e. Replace the current SMA name with the new name.  
  
Do not leave a space between the colon and the new SMA name. For example: `Appl_name : Colorado`.
    - f. Save the file and exit the text editor.
    - g. Restart the BC service.

The host computer can now resume communications with the BC server.

## Migrating HSG Jobs to HSV-based Storage Systems

If you need to move HSG jobs to HSV-based storage systems, you may need to edit jobs as follows:

- Modify jobs to point to the new storage

- Modify jobs that use the CLONE operation

HSV-based storage systems do not support the CLONE operation. You cannot simply edit the existing CLONE operation in the job; the drive letter for the HSV will not be visible in the drop-down menu for this operation (even though the storage is visible on the Resources page). You must delete the CLONE operation and select SNAP or SNAPCLONE; the GUI will then provide the HSV storage drive letters.

Refer to the Online Help & User Guide files for details on these operations.

## Synchronizing Passwords—HSV-based Storage Only

Whenever you change passwords on the SMA Account Login page, you must make other BC utilities aware of this change so passwords remain in sync.



**Caution:** Changing passwords while BC jobs are running can cause BC jobs to fail, and loss of data may occur. Change passwords on the SMA Account Login page only when BC jobs are in one of the following states: any Idle state, Invalid, or Undo Complete.

---

For SMA software, password control is established using the SMA Account Login page. HSV-based storage systems use the Remote Access page for establishing access to these resources. BC uses the Remote Access feature to access HSV-based storage systems. All passwords must be in sync for BC jobs to run.



**Caution:** Whenever the SMA login password is changed from the SMA Account Login page, always update the Command View EVA password on the Remote Access page. Failure to maintain synchronization between the SMA Account Login page and Remote Access page prevents BC jobs from using HSV-based resources. This can lead to reduced operational capability, and failure of BC jobs that include these resources.

---

**Note:** For information on changing the SMA login password on the SMA Account Login page, refer to the SMA software documentation.

---

To synchronize Remote Access with the SMA Account Login page, use the following procedure:

1. Browse to the SMA and log in.
2. Click **Settings**.
3. Click **Remote Access**.
4. On the **Manage Application Passwords** page, select **command view eva**.
5. Under the **Tasks** column, click **Properties**.

A Modify an application password page displays.

6. Type or update the required fields:
  - Domain Name
  - Username—update if desired
  - Password—change to reflect the new SMA login password
  - Confirm Password
7. Click **OK**.

If the appropriate password information was entered, the SMA login and Command View EVA passwords are synchronized. All HSV-based storage system hosts associated with this SMA are displayed on the BC Resources page.

---

**Note:** In large configurations, the Resources page may take up to 30 minutes to update.

---

8. Restart the BC server service. See “[Starting/Stopping the BC Server](#)” on page 93 for details.

## Adding HSV Storage

If you are adding HSV storage systems, be aware that BC checks the HSV license information at startup. Adding or changing license information requires restarting the BC server before BC can recognize these changes.



# Using Volume Groups and Domains

## 8

This chapter describes the requirements and best practices when using volume groups. Topics include:

- [Definition: Volume Groups and Domains](#), page 102
- [Volume Group/Domain Requirements and Support](#), page 103
- [AIX Requirements and Support](#), page 104
- [HP-UX Requirements and Support](#), page 106
- [Tru64 UNIX Requirements and Support](#), page 110

## Definition: Volume Groups and Domains

A *volume group* (AIX and HP-UX) or a *domain* (Tru64 UNIX) is a set of one or more physical volumes from which space can be allocated to one or more logical volumes or filesets. Volume groups and domains are the minimum containers that BC uses for replication.

The HP interpretation of volume groups and domains includes a configuration that can consist of multiple HSG-based or HSV-based storage systems and multiple units. Each volume group or domain is referenced by a single name and consists of physical volumes. A logical volume or fileset is a subset of the volume group or domain and is mountable.

## Volume Group/Domain Requirements and Support

Table 29 lists the requirements and support for using volume groups and domains in a BC network.

**Table 29: Volume Group/Domain Requirements and Support**

Required	Remarks
BC storage	BC supports any volume group or domain that has all physical volumes on an HSG-based or HSV-based storage system that BC can access (visible through the SMA).
Identical storage version levels	HP strongly recommends installing an identical ACS version level on all HSG-based storage systems, and an identical VCS version level on all HSV-based storage systems.
Volume syntax in BC job operations	<p>Although BC job operations provide both unit and volume syntax, you should use the volume syntax. Volume syntax ensures that the replication sources are specified in terms of the host on which they reside and the applicable fileset or domain the logical volume or volume group name. This method allows BC to quiesce the AdvFS domain volume group being replicated and also allows BC to gather the metadata necessary to reconstruct the replicated domain volume group on the mount-on host.</p> <p>With unit syntax, replication sources are specified in terms of the applicable storage system and unit number. This method does not provide any mechanism for quiescing an AdvFS domain or volume group for gathering the metadata necessary to reconstruct a domain on the volume group on the mount-on host.</p> <p>Unit-style syntax is suitable only for UFS or raw devices and is not supported with AdvFS non-LVM devices.</p>
Not Supported	Remarks
Mounting two copies of the same volume group	BC does not support mounting two copies of the same volume group on the same host.
Windows 2000 Dynamic Disks	Although BC allows you to specify Dynamic Disks as source units when creating a BCV, attempts to mount the BCV will result in a job failure.
Best Practices	Remarks
Limit physical volumes in volume group or domain	BC jobs run faster and more efficiently the fewer physical volumes (units) that comprise a volume group or domain.
Mixing storage systems	HSG- and HSV-based storage systems should not be mixed in a volume group, domain, or single BC job.
Check resources	Before running a BC job, make sure that sufficient resources exist on each HSG-based or HSV-based storage system to simultaneously replicate all of the physical volumes that comprise a volume group. BC must find free disk space on the same storage system as the source disks.

## AIX Requirements and Support

This section lists AIX requirements, support, and other important information.

### AIX Logical Volume Manager Support

[Table 30](#) lists support for Logical Volume Manager (LVM).

**Table 30: AIX LVM Support**

Topic	Supported/Not Supported
Storage	All physical volumes must be located on HSG- or HSV-based storage systems.
Logical volumes	No more than 128 logical volumes per volume group are supported.
Disks	No more than 16 disks per volume group are supported.
File systems	BC supports the VERITAS File System (VxFS) and High-Performance File System (HFS).
Volume groups in jobs	One volume group per job is supported; replicating multiple volume groups requires the use of multiple BC jobs.
JFS log file name	Any volume group Journaled File System (JFS) log file name must be unique across all BC host agents.
Minimum replication unit	A volume group is the minimum replication unit. The data for a given logical volume can be located on any or all of the physical disks in a volume group. As a result, a hardware-level replication of the logical volume (like that performed by BC) must copy all of the physical volumes in the volume group in order to capture all of the data. This limitation also applies to logical volumes that have been extended to specific disks. For example, creating a copy of a volume group with six physical volumes requires replication of all six volumes.
Volume group names	Each volume group name on source hosts must be unique. HP recommends using a volume group name that identifies the host on which the group resides, for example Host1VG1.  A common BC configuration involves the allocation of a single BC host agent computer as a backup server, which is used to mount and back up the replicated volume groups from multiple source hosts. Such configurations are supported; but if more than one replicated volume group is to be presented to the backup server at the same time, the source volume groups from which the copies are created must have unique names.



**Table 30: AIX LVM Support (Continued)**

Topic	Supported/Not Supported
Replicating and mounting units	AIX cannot replicate a unit and then mount that unit on the same host. Copying an entire volume group results in a new group that has the same volume group name as the source. No two volume groups can have the same name on the same host.

## AIX—What You Should Know

Table 31 list important information about AIX.

**Table 31: AIX—What You Should Know**

Topic	Remarks
Duplicate volume group names	Duplicate volume group names are not supported for AIX. A BCV of a source volume group cannot be mounted back to the same host; a second copy of the same source cannot be mounted to the same destination.
Basic volume group configuration	HP strongly recommends creating a basic volume group configuration. A basic configuration consists of only one logical volume that is connected to a single volume group made up of one physical volume.
Multiple hosts	For multiple hosts in the BC network, use the basic configuration for each host.
Raw logical volumes	Do not create BC jobs that try to mount more than one raw logical volume per volume group. A single raw mount will make all logical volumes in the volume group available. Trying to mount multiple raw logical volumes per volume group will cause problems during job execution and undo. This limitation applies only to raw logical volumes.
Replication copies	A clone or snapshot copy of an AIX 5.1 volume group cannot be mounted on an AIX 4.3.3 host, and vice versa.  Do not run simultaneous BC jobs that are trying to replicate the same volume group. Part of the process of replicating an AIX volume group involves placing the volume group that is being copied into a consistent state. BC does this through the <code>VGfreeze</code> utility. If multiple <code>VGfreeze</code> processes are executed against the same volume group at the same time, one or more processes will fail, causing the BC job to fail.

## HP-UX Requirements and Support

This section lists HP-UX requirements, support, and other important information.

### HP-UX Logical Volume Manager Support

Table 32 lists BC support for LVM.

**Table 32: HP-UX LVM Support**

Topic	Supported/Not Supported
Logical volumes	No more than 128 logical volumes per volume group are supported.
Disks	No more than 16 disks per volume group are supported.
File systems	BC supports the VERITAS File System (VxFS) and High-Performance File System (HFS).
Minimum replication unit	A volume group is the minimum replication unit. The data for a given logical volume can be located on any or all of the physical disks in a volume group. As a result, a hardware-level replication of the logical volume (like that performed by BC) must copy all of the physical volumes in the volume group in order to capture all of the data. This limitation also applies to logical volumes that have been extended to specific disks. For example, creating a copy of a volume group with six physical volumes requires replication of all six volumes.

### HP-UX—What You Should Know

Table 33 lists important information about HP-UX.

**Table 33: HP-UX—What You Should Know**

Topic	Remarks
Basic volume group configuration	HP strongly recommends creating a basic volume group configuration. A basic configuration consists of only one logical volume that is connected to a single volume group made up of one physical volume.
Multiple hosts	For multiple hosts in the BC network, use the basic configuration for each host.
Raw logical volumes	Do not create BC jobs that try to mount more than one raw logical volume per volume group. A single raw mount will make all logical volumes in the volume group available. Trying to mount multiple raw logical volumes per volume group will cause problems during job execution and undo.

**Table 33: HP-UX—What You Should Know (Continued)**

Topic	Remarks
Replicated volume groups	<p>A clone or snapshot copy of an HP-UX 11.11 (11iv1) volume group cannot be mounted onto an HP-UX 11.0 host, and vice versa.</p> <p>Do not run simultaneous BC job that are trying to replicate the same volume group. Part of the process of replicating an HP-UX volume group involves placing the volume group that is being copied into a consistent state. BC does this through the <code>VGfreeze</code> utility. If multiple <code>VGfreeze</code> processes are executed against the same volume group at the same time, one or more processes will fail, causing the BC job to fail.</p>
Volume group maximum setting	<p>The HP-UX operating system supports a default maximum volume group of 10. Because each BC replication job creates a new volume group on the mount-on host, systems at or near the maximum may experience job failures. Use the <code>kmtune</code> utility to increase the maximum number of volume groups to an appropriate level.</p>
Volume group name	<p>Each volume group name on source hosts must be unique. HP recommends using a volume group name that identifies the host on which the group resides, for example <code>Host1VG1</code>.</p> <p>A common BC configuration involves the allocation of a single BC host agent computer as a backup server, which is used to mount and back up the replicated volume groups from multiple source hosts. Such configurations are supported; but if more than one replicated volume group is to be presented to the backup server at the same time, the source volume groups from which the copies are created must have unique names.</p>
Layout or capacity changes in logical volume group	<p>If the configuration of any of the volume groups on the HP-UX host changes (in terms of physical disks that comprise the volume group or the logical volumes that are contained in the volume group), the BC configuration files must be updated by running the <code>updatehost.sh</code> script located in the directory <code>.../opt/CPQevm/bin</code>.</p>
Mapfiles	<p>You must create a mapfile for each volume group that will be replicated using BC. The mapfile defines the logical volume name-to-number association for all of the logical volumes in a volume group. Without this information, the operating system assigns default names to all of the logical volumes in the replicated volume group and the original names are lost. Without the original name, it is difficult to associate a source volume with its replicated copy.</p> <p>If the logical volume configuration for a volume group changes (by the addition or deletion of a logical volume), you must generate an updated mapfile. See <a href="#">“Creating and Updating a Mapfile for HP-UX Volume Groups” on page 108</a> for instructions.</p>

## Creating and Updating a Mapfile for HP-UX Volume Groups

BC includes a script named *Generate\_Mapfiles.ksh*, which generates a mapfile for each volume group. This script closes all the logical volumes (unmounts the file systems) and deactivates the volume group before creating the mapfile. After creating the mapfile, BC reactivates the volume group and reopens the logical volumes. This process completes within two minutes for most volume groups. The volume group and all logical volumes in it are unavailable during this period. Schedule this process on an as-needed basis to minimize its effect on normal operations.

BC does not automatically display HP-UX volume groups on the Resources page. To display an HP-UX volume group on the Resources page, you must create the mapfile for the volume group after installing the BC host agent software for HP-UX, or you must update the mapfile after changing the volume group. Volume groups with invalid mapfiles are not displayed on the BC Resources page and cannot be used in BC jobs.

To create and update a mapfile after you have installed the BC host agent software for HP-UX, or after you have changed the volume group, follow these steps:

1. Go to the `/opt/CPQevm/bin` directory:

```
cd /opt/CPQevm/bin
```

2. Start the mapfile script by typing the `generate mapfile` command in any of the formats shown here:

- Menu-driven procedure:

```
./Generate_Mapfiles.ksh
```

- Mapfiles for one or more specified volume groups:

```
./Generate_Mapfiles.ksh <vg_name1> <vg_name2> ... <vg_namen>
```

the `-q` argument suppresses warning messages:

```
./Generate_Mapfiles.ksh -q <vg_name1> <vg_name2> ...  
<vg_namen>
```

- Mapfiles for all volume groups:

```
./Generate_Mapfiles.ksh -a
```

---

**Note:** Trying to generate a mapfile for the root volume group (default name vg00) triggers the warning message, `Could not create mapfiles for all Volume Groups`. This message is also issued for other volume groups if, for any reason, the system cannot process the volume group and generate a mapfile.

---

The mapfile is created in the VGmaps directory; its name is in the format *mapfile.\_vgname*. Failed volume groups are created in the VGmaps directory (`/opt/CPQevm/bin/VGmaps/failed_map_list`). The logfile that is created is in the logs directory and is called *generate\_mapfiles.logfile*.

## Tru64 UNIX Requirements and Support

This section describes the Tru64 UNIX requirements, support, and other important information.

### Tru64 UNIX AdvFS Support

[Table 34](#) lists AdvFS support and limitations.

**Table 34: Tru64 UNIX AdvFS Support**

Topic	Supported/Not Supported
Storage	Each domain must consist entirely of HSG- or HSV-based storage systems.
Disks	No more than 8 disks are allowed per AdvFS domain.
Filesets	No more than 128 filesets per Tru64 UNIX host are supported. The configuration can be one domain with 128 filesets, or 32 domains with 4 filesets each.

### Tru64 UNIX Logical Storage Manager Support

[Table 35](#) lists LSM supported and non-supported features.

**Table 35: Tru64 UNIX LSM Support**

Topic	Supported/Not Supported
LUNs	A maximum of 8 LUNs per LSM disk group are supported.
LSM stripesets	Only LSM stripesets are supported. Parity and mirroring are not supported.
LSM volumes	<ul style="list-style-type: none"><li>■ A maximum of 8 LSM volumes are supported per AdvFS domain.</li><li>■ Only AdvFS on LSM volumes is supported. Raw files systems or UFS are not supported.</li></ul>
LSM disk groups	<ul style="list-style-type: none"><li>■ No more than one LSM disk group is supported per AdvFS domain.</li><li>■ LSM disk groups can only contain whole physical disks—partitions are not supported.</li><li>■ BC can only replicate an entire disk group: BC 2.2 cannot snap or clone a single volume in a disk group.</li></ul>
LSM volumes and non-LSM disks	Combinations of LSM volumes and non-LSM disks in an AdvFS domain are not supported.

## Tru64 UNIX—What You Should Know

Table 36 lists important information about Tru64 UNIX.

**Table 36: Tru64 UNIX—What You Should Know**

Topic	Remarks
Minimum replication unit	<p>Specifying either a single fileset or an entire domain as the replication source results in the entire domain being copied. Because an AdvFS domain is essentially a pool of storage that can be spread across many different disks, a method does not exist that can determine which disks contain the data for a given fileset.</p> <p>The only way to reliably copy fileset data is to copy <i>all</i> of the disks that comprise the domain.</p>
Do not run more than one BC job at the same time to replicate the same domain.	<p>Part of the process of replicating an AdvFS domain volume group involves placing the volume group that is being copied into a consistent state. BC does this through the use of a utility called <code>VGfreeze</code>. The specific behavior of <code>VGfreeze</code> is determined by the state of the <code>UNMOUNTVGSOURCE</code> parameter. If multiple <code>VGfreeze</code> processes are executed against the same volume group at the same time, they conflict and one or more of these processes will fail, causing the BC job to fail.</p>





# Troubleshooting

## 9

This chapter describes known problems and suggested resolutions that are not in the BC Release Notes. Topics include:

- [BC Logs and Other Diagnostic Files](#), page 114
- [BC Server Limitations and Known Problems](#), page 117
- [All OSs: Host Agent Limitations and Problems](#), page 131
- [AIX Host Agent Limitations and Problems](#), page 133
- [HP-UX Host Agent Limitations and Problems](#), page 134
- [Solaris Host Agent Limitations and Problems](#), page 136
- [Tru64 UNIX Host Agent Limitations and Problems](#), page 137
- [Windows Host Agent Limitations and Problems](#), page 140

## BC Logs and Other Diagnostic Files

BC logs are the primary source of diagnostic and troubleshooting information. There are two types of logs:

- *SMA*—these logs can be viewed in the BC GUI Logs page.
- *BC host agent*—these logs are stored in directories on the host for each host operating system.

To prevent the BC log files from consuming too much disk space, BC automatically archives the existing log file and starts a new one. Archiving occurs whenever the BC log file size reaches 10 MB or whenever the BC server is restarted.

### SMA Logs

[Table 37](#) lists the BC logs maintained on the SMA.

**Table 37: BC Storage Management Appliance Logs**

Log Type	Log Name	Versions Maintained	Description
Job	<i>job_&lt;job_name&gt;.txt</i>	7	When a job runs for the first time, a BC job log file (such as <i>job_name.txt</i> ) is created for this job and the individual operations that comprise the job are recorded in the job log file. Each time a job is run, the current BC job log file for that job is archived and a new BC job log file is created.
Broadcaster	<i>sb.txt</i>	8	Generally not useful in troubleshooting.
Device Manager/ Element Manager	<i>bcweb.txt</i>	7	Generally not useful in troubleshooting.
BC Server	<i>bc.txt</i>	7	Provides BC server information.
Storage	<i>sfo.txt</i>	7	Provides storage information.

**Table 37: BC Storage Management Appliance Logs (Continued)**

Log Type	Log Name	Versions Maintained	Description
Host	<i>&lt;host_name&gt;host.txt</i>	1	Provides host information.
Host Volume	<i>&lt;volume_name&gt;volume.s.txt</i>	1	Provides host volume information.
Resource	<i>ConfigurationReport.txt</i>	1	Provides a point-in-time list of discovered hosts and subsystems.

## Host Agent Logs

Host agent computers generate BC Switchboard logs which contain detailed information about the interaction between the BC host agent computer and the BC server. BC Switchboard logs are useful for diagnosing MOUNT, SUSPEND, RESUME, and LAUNCH operational issues.

Host agent logs can be found in the directories listed in [Table 38](#) if BC software was installed in the default directory.

**Table 38: Host Agent Logs**

For This Operating System...	Go To...
AIX	<i>/usr/opt/CPQevm/bin/logs</i>
HP-UX	<i>/opt/CPQevm/bin/logs</i>
OpenVMS	<i>/user/opt/CPQevm/bin/logs</i>
Solaris	<i>/opt/CPQevm/bin/logs</i>
Tru64 UNIX	<i>/usr/opt/CPQevm/bin/logs</i>
Windows 2000/NT/2003	<i>\Enterprise Volume Manager\bin\logs</i>

## Host Agent Configuration Files

The BC server generates configuration files, which contain current host, volume, and HBA information about each BC host agent computer. Two configuration files exist for each host agent computer in \Enterprise Volume Manager\bin\hosts:

- *servername.hst*—contains host and HBA information
- *servername.vol*—contains volume information

These files contain low-level information in eXtensible Markup Language (XML) format and are best understood by authorized service personnel.

## BC Server Limitations and Known Problems

This section describes BC server limitations and known problems, including:

- [Accessing BC](#), page 118
- [Job Errors and Problems](#), page 122
- [GUI Behaviors](#), page 127
- [GUI Resource Display Problems](#), page 128

## Accessing BC

This section describes problems related to accessing BC using OSM V1.0C.

### General Problems

*Description:* Problems with SMA Account Login page and Java errors.

Types of problems include:

- The area for entering the Username and Password is missing from the SMA Account Login page, preventing login to the SMA software.
- Java, Java Applet, or JavaScript errors are displayed, preventing display of the BC GUI.
- Only the BC GUI top header is displayed; there is no information in the BC pages.
- Error message: The Java2 Plug-In necessary to run this applet has not been installed
- Error message: The Java Runtime Environment cannot be loaded

*Resolution:* Check the following:

- Make sure you are using a supported browser and JRE listed in “[Browser/JRE Requirements and Support](#)” on page 55. You can download a supported JRE from the BC server, as described in “[Browsing to the BC GUI](#)” on page 75.
- If installing a new browser, an updated browser version, JRE, or an updated JRE version, always:
  - Close all open browser windows; open a new browser session to browse to the SMA after installation has completed
  - If problems persist (such as lack of a display in the lower portion of the BC GUI), try rebooting
  - If problems persist, clear the browser and JRE cache as follows:

To Clear Cache for...	Use this Procedure...
Internet Explorer	<ol style="list-style-type: none"><li>1. Choose <b>Tools &gt; Internet Options</b>.</li><li>2. Click the <b>General</b> tab.</li><li>3. Under <b>Temporary Internet files</b>, click <b>Delete Files</b>.</li><li>4. Click <b>OK</b>.</li><li>5. Click <b>OK</b> to close the dialog box.</li></ol>

To Clear Cache for...	Use this Procedure...
Netscape	<ol style="list-style-type: none"> <li>1. Choose <b>Edit &gt; Preferences</b>.</li> <li>2. In the navigation pane, choose <b>Advanced &gt; Cache</b>.</li> <li>3. Click <b>Clear Memory Cache</b>.</li> <li>4. Click <b>OK</b>.</li> <li>5. Click <b>Clear Disk Cache</b>.</li> <li>6. Click <b>OK</b>.</li> <li>7. Click <b>OK</b> to close the dialog box.</li> </ol>
JRE Plug-in	<ol style="list-style-type: none"> <li>1. Open the Java plug-in console.</li> <li>2. Click the <b>Cache</b> tab.</li> <li>3. Click <b>Clear JAR Cache</b>.</li> <li>4. Close the Java plug-in console.</li> </ol>

## Unable to Browse to SMA

**Description:** Unable to browse to the SMA Device Home page or the Account Login page.  
The problem may be that the domain name server (DNS) is not recognizing the SMA.

**Resolution:** To correct this problem:

1. Insert an "A" record (host record) and a pointer record (*PTR record* or a *reverse lookup record*) on the DNS server for the SMA.
2. For Dynamic Host Configuration Protocol (DHCP) environments, set a permanent lease and reservation for the SMA.
3. Make sure the DNS is configured for DHCP Auto Registration.

An alternative solution is to modify the “Hosts” file on each browsing computer and SMA:

---

**Note:** SMAs and host agent computers must share information to be visible to each other.

---

1. Locate the “Hosts” file:  
     For Windows: %systemroot%\System32\Drivers\Etc  
     For UNIX: /etc
2. Using a text editor, open the “Hosts” file and add a line to the end of the file that reflects the domain name format:  
     11.222.33.444 swma1A2B3C.roadrunner.acme.net  
     or  
     11.22.33.44 <SMA\_name>
3. Save the file and exit the editor.

## Windows 2000/NT/2003 Access Problems

*Description:* **Cannot access BC, even after uninstalling previous JRE versions.**

Multiple installations of a JRE on a browsing computer may result in not being able to browse to BC, despite uninstalling previous versions.

*Resolution:* To correct this problem:

1. Click **Start > Settings** on the Windows taskbar.
2. Select **Control Panel** and double-click the Java plug-in icon on the Control Panel.
3. On the Java Plug-in Control Panel, select the **Advanced** tab.
4. Instead of “Use Java Plug-In Default,” select the correct plug-in and installation directory from the menu.

*Description:* **Cannot access BC, and you are using high security Internet Explorer browsers.**

*Resolution:* To correct this problem:

1. Remove all existing JRE or Java Virtual Machine (JVM) installations that are listed in the Add/Remove Programs windows.



2. If Netscape has been previously installed, uninstall it.

Netscape automatically installs a JRE that may interfere with Internet Explorer on Windows 2000/NT/2003.

3. Because uninstalling Netscape does not uninstall the JRE, manually delete JRE subdirectories under the Java or JavaSoft directories:

C:\Program Files\Java

C:\Program Files\JavaSoft

4. Exit Internet Explorer and close all browser windows.
5. Install the supported JRE.
6. Reopen Internet Explorer and select **Internet Options** from the **Tools** drop-down menu:
7. On the **Privacy** tab, ensure that the slider is set no higher than Medium-High. If the slider is missing, restore it by clicking on the **Default Level** button. A minimum level of “cookie” acceptance is required by the SMA software.
8. On the **Security** tab, ensure that the slider for the Internet Web content zone is set no higher than Medium. If the slider is missing, restore it by clicking on the **Default Level** button.

## Job Errors and Problems

This section lists errors that may be displayed in a job log or Job Monitor status bar, and general job problems. For more information on job planning and rules, refer to the Online Help & User Guide.

### Error: subsystem not known (case-sensitive identifier)

*Description:* BC jobs containing HSV subsystems fail if an HSV subsystem name contains a space at the end.

*Resolution:* Remove the space at the end of the HSV subsystem name.

### Error: Could Not Map Host/Volume to physical storage

*Description:* Mixing VOLUME and UNIT syntax in a job is not valid. Although BC allows you to mix VOLUME and UNIT syntax in a job, and the job will pass validation, the job will fail.

*Resolution:* Change the job to use VOLUME or UNIT syntax exclusively.

### Error: Storage Command Failed | <subsystem\_name> | SCMI Logical Disk Sharing

*Description:* If you execute overlapping SNAPCLONE jobs against the same source, the second job may fail because the SNAPCLONE created by the first job may not have completed the normalization process. HSV-based storage systems support only one simultaneous SNAPCLONE on a given device.

*Resolution:* Allow the first SNAPCLONE to fully normalize before running the second job, or include a NORMALIZE operation as the first step of the second job.

### Error: Storage Command Failed. Failure to present unit |x| on |HSVxx|/

*Description:* For BC jobs to mount on an HSV-based storage system, BC requires the existence of at least one port for each host.

*Applies to:* HSV-based storage systems using HSV Element Manager v2.0a

*Resolution:* Make sure that all hosts for the storage system have at least one port enabled.

### Error: The job name is too long

*Description:* You have exceeded the maximum length of 128 characters when creating a job name.

*Resolution:* Reduce the number of characters in the job name.

**Error: Operation uses multiple subsystems, but no matching SET CA\_SUBSYSTEM found**

*Description:* This error can occur for the following reasons:

- The job is using storage systems in a Continuous Access EVA environment, and you have not specified a SET CA\_SUBSYSTEM operation.
- The SET CA\_SUBSYSTEM operation points to an invalid storage system.
- The job is using more than one storage system in a Continuous Access EVA environment, and you have not specified a SET CA\_SUBSYSTEM operation that corresponds to that storage.

*Resolution:* Check that you have the correct number of SET CA\_SUBSYSTEM. Check that you did not mistype the subsystem name or select one that is not valid. (NOTE: HSG80 storage systems are not valid in a Continuous Access EVA environment.)

**Error: Cannot do discrete unmount on a Volume Group**

*Description:* Volume groups are not supported for the UNMOUNT operation.

*Resolution:* Rewrite the job without using the UNMOUNT operation.

**Error: Cannot present a BCV that is already presented to the fabric**

*Description:* You cannot present a BCV that is already presented in the SAN fabric.

*Resolution:* Rewrite the job.

**Error: Mount Point not found**

*Description:* This occurs during job validation if a SNAP or CLONE VOLUME operation refers to a source volume that does not exist.

*Resolution:* Check the source volume in question.

**Error: Cannot do discrete unmount on a multi-partition disk**

*Description:* A job using the UNMOUNT operation is pointing to a multi-partition disk

*Resolution:* The UNMOUNT operation does not support multi-partition disks.

## General Job Failures

**Description:** **Job is failed and you cannot undo the job.**

If the configuration of a storage system is changed (external to BC) while jobs are running, the changes may cause the jobs to fail. In some cases, the ability to undo jobs that fail in this manner may be impaired and manual cleanup of the storage configuration may be required.

**Resolution:** To prevent this problem:

- Make sure that the storage configurations remain stable while running BC jobs.
- Always perform a manual BC storage refresh after making changes to the storage configuration, to update the affected subsystem.

**Description:** **Undo job is not failing and should be.**

**Resolution:** There is no fix for this behavior in this release. BC ignores the *check\_results*, *result\_type*, and *result\_value* 'True' and 'False' parameters in the LAUNCHUNDO operation and will never fail a job during undo.

**Description:** **Job failed.**

Have you recently manually deleted or modified an HSG clone?

BC maintains a record of resources used for all HSG clone operations on the SMA. If you did not manually delete the corresponding *.sto* file for the clone device, jobs associated with HSG-based storage systems may start to fail.

**Resolution:** Go to: *program files\Compaq\sanworks\enterprise volume manager\bin* and delete the *.sto* file associated with the clone device.

**Description:** **Job failed.**

**Applies to:** Volume groups used in Tru64 UNIX, HP-UX, or AIX, and a job with more than one BCV.

BC jobs that involve the above OSs using volume groups, and the creation of more than one BCV, require a specific sequence of operations.

**Resolution:** Use the format sequence: SNAP, SNAP, MOUNT, MOUNT (instead of SNAP, MOUNT, SNAP, MOUNT). Basically, separate the MOUNT steps from the BCV-creation steps (SNAP, CLONE, NORMALIZE, or SPLIT). Refer to the job templates on the Job Create page for examples of step sequences associated with the most common job types.

*Description:* **Job failed.**

Did you mount a non-BC-created BCV?

*Resolution:* BC does not support jobs that mount BCVs that are not created by BC. The Resources page will show non-BC-created BCVs, and you can manually type in a BCV in the MOUNT operation, but the job will fail.

*Description:* **Job failed.**

Did you create a BCV in one job and mount it in a different job?

*Resolution:* BC does not support mounting a BCV in a different job than the job where the BCV was created.

*Description:* **Job failed.**

Did you create a job where you manually typed in unit number or virtual disk name in a SNAP UNIT, SPLIT UNIT, or MOUNT UNIT operation?

*Resolution:* Check to make sure these entries are correct and valid. Inappropriate choices can lead to job failures.

*Description:* **Job failed.**

If you've updated from OSM V1.0C to SMA v2.0, a job may fail if the SMA automatic restart has occurred when a BC job is running.

The SMA is configured to automatically restart the core appliance services (not including BC) at the default time of 3:00 AM every Sunday. One of the services restarted is the HSG Element Manager, which BC depends on for communication access to the storage hardware. When BC detects a restart of the HSG Element Manager service, BC automatically enters an idle state until the HSG Element Manager service returns. If a BC job is running when this service restart occurs, the BC job may fail.

*Resolution:* To prevent this type of failure, do one of the following:

- Schedule all BC jobs so that they complete before the automatic restart time.
- Start all BC jobs after the automatic restart time.
- Change the time of the SMA resynchronization to avoid having it occur while you are running jobs.

*Description:* **Job failed.**

Do all BCV variable names in your job begin with a dollar sign (\$)?

*Resolution:* BC requires that you use the dollar sign character (\$) when specifying the name of a BCV variable. For example, \$sales\_bcv or \$hr\_snap \_Oct2003 are valid entries.

## GUI Behaviors

This section describes issues that can arise from GUI behaviors.

### Job Monitor Page—Percentage Complete Bar

*Description:* Sometimes the step-percent-complete bar on the Job Monitor page may drop from a larger percentage to a smaller one.

*Explanation:* This does not necessarily indicate a problem. For example, a clone normalization step may reach 100% and then drop down when two jobs that normalize the same unit are both running. Because BC displays the average percent complete of all mirror members, the step-percent-complete bar in one job may drop to a smaller percentage when the second job begins its normalization.

### BC GUI Takes a Long Time Loading

*Description:* Loading the BC GUI takes a long time.

*Explanation:* The BC GUI makes extensive use of Java applets. When a new Web browser session is established, applets may take a minute or more to download, depending on current network conditions. After the applets are downloaded, they remain stored in the Web browser memory cache until a new browser session is established. The number of storage systems can also affect the time required to load the GUI.

### Login Page Displays After Refresh

*Description:* Login page is displayed while working in the BC GUI.

*Explanation:* A time-out occurs if there is no activity in the BC GUI for 15 minutes and the Login page is displayed. This is indicated by a Refresh Browser message in the Running Jobs window in the BC GUI. Information not saved before the refresh is lost.

## GUI Resource Display Problems

This section describes problems related to resources not showing in the BC GUI.

### Host Agents Not Displaying

*Description:* A BC host agent computer does not show up in the BC Resources page, or it shows up in the BC Resources page, but does not display any volume information.

The bidirectional communication between the BC server and the individual BC host agent computers is accomplished through an encrypted TCP socket interface. For this communication interface to work properly, the following must be true:

- Each BC host agent computer must be able to resolve the network name of the SMA.
- The SMA must be able to resolve the network names for each of the BC host agent computers.

Given the wide variety of possible network configurations, the default methods used by BC to establish this communications interface may not always work properly. Assuming that the BC host agent software is installed and running properly, the most likely reason is that the BC host agent computer cannot communicate with the SMA using the network name entered during the BC host agent installation.

*Resolution:* To correct this problem:

1. Using *ping*, *nslookup*, or another network utility, determine the name or Internet Protocol (IP) address that the BC host agent should use to communicate with the SMA.
2. Stop the Switchboard service on the BC host agent.
3. Open the *sb.ini* file in the `../CPQevm/bin` or `../Enterprise Volume Manager/bin` directory.
4. Change the **APPL\_NAME** field to the name determined in [step 1](#).
5. Save the file.
6. Restart the Switchboard service or daemon.



## Host Agent Computer Does Not Display Volume Information

*Description:* Host volume information is not visible on the Resources page.

For this problem, the BC host agent is able to communicate with the SMA, but the BC server is unable to communicate with the BC host agent. By default, the BC server uses the NetBios name of the BC host agent computer. In some cases, the SMA may be unable to resolve the BC host agent computer using this name.

*Resolution:* In the *sb.ini* file on the BC host agent computer, there are two optional fields: **NEWHOSTNAME** and **SHOWFQDN**. By default, both are set to zero. There are two ways to solve the problem:

- Set the **SHOWFQDN** field to 1 to allow the BC server to use the Fully Qualified Domain Name of the BC host agent computer.
- or
- Use the **NEWHOSTNAME** field to specify the BC host agent computer's IP address, or any other name that might work.

In a workgroup environment, you may need to edit the host file on the SMA.

## Storage Systems Not Visible

*Description:* Storage systems are not visible on the Resource page.

- Resolution:*
- Check the Element Manager display to verify that the storage system is being presented to BC. Also, make sure storage systems are zoned for the appropriate SMA.
  - If you have HSV-based storage systems, are they visible?
  - If not, have you recently changed passwords on the SMA Account Login screen and not updated passwords on BC utilities? If yes, see [“Synchronizing Passwords—HSV-based Storage Only”](#) on page 98.
  - If you have HSG-based storage, have the disks been initialized? BC must know the capacity of an HSG-based storage system before it can determine if the disk can be used for a clone or snapshot. Unused HSG-based disks that have not been initialized do not report a capacity and cannot be used by BC. Make sure all unused disks have been initialized with the HSG-based CLI `INITIALIZE` command.

## HSV Drive Letter Not Displayed in CLONE Operation

*Description:* HSV-based storage systems are visible on the Resources page, but the drive letter is not visible in the CLONE step when editing an existing HSG job.

*Resolution:* The CLONE operation is not supported on HSV-based storage systems. When migrating jobs with databases from HSG-based storage systems to HSV-based storage systems, you cannot edit the existing HSG job; you must re-create the job using the SNAP or SNAPCLONE operation. See “[Migrating HSG Jobs to HSV-based Storage Systems](#)” on page 97 for more information.

# All OSs: Host Agent Limitations and Problems

This section describes host agent problems that are applicable to all supported operating systems.

## Error: Remote spawn request has timed out

*Description:* A host agent process has taken too long to complete.

*Applies to:* Jobs containing LAUNCH, LAUNCHUNDO, SUSPEND, or RESUME operations.

BC jobs can time out and report this error if a process spawned by a BC job containing a LAUNCH, LAUNCHUNDO, SUSPEND, or RESUME operation is not completed within 30 minutes.

*Resolution:* Ensure that the process is not hung, and that it has a valid reason for taking more than 30 minutes to complete. If necessary, the timeout value can be increased by modifying the *sb.ini* file on the appropriate BC host/hosts as follows:

1. Stop the Switchboard service on the host computer.
2. Open the BC host agent *sb.ini* file in a text editor
3. Modify the PIPE\_READ\_TIMEOUT value, entering the time in seconds.
4. Save the file.



**Caution:** Ensure that no BC jobs that involve the host are running before performing the next step.

---

5. Restart the BC host agent service or daemons.

## Error: Mount operation timed out

*Description:* A mount operation has taken too long to complete.

BC jobs can time out and report this error if a MOUNT process does not complete within 6000 seconds.

*Resolution:* Ensure that the process is not hung, and that it has a valid reason for taking more than 6000 seconds to complete. If necessary, the timeout value can be increased by modifying the *evm2.ini* file on the SMA as follows:

1. On the SMA, open the *evm2.ini* file in a text editor (*.\Enterprise VolumeManager\bin\emv2.ini*)

2. Modify the **mountTimeout** value, entering the time in seconds.



**Caution:** Ensure that no BC jobs that involve the host are running before performing the next step.

---

3. Save the file.
4. Restart the BC server.

## Mount Failure on HSG80s

*Description:* Mount failures may occur on hosts that have mixed offset entries.

*Resolution:* All entries in the HSG80 connection table for a given host must use the same unit offset.

## AIX Host Agent Limitations and Problems

This section describes AIX host agent limitations and known problems.

### Job Failure: Mounting Raw Logical Volumes

*Description:* Mounting multiple raw logical volumes per volume group causes problems during job execution and undo.

*Resolution:* Do not create BC jobs that try to mount more than one raw logical volume per volume group. A single raw mount will make all logical volumes in the volume group available. This limitation applies only to raw logical volumes.

### Job Failures: Using Volume Groups

*Description:* BC job using volume groups failed.

Part of the process of replicating an AIX volume group involves placing the volume group that is being copied into a consistent state. BC does this through the `VGfreeze` utility. If multiple `VGfreeze` processes are executed against the same volume group at the same time, one or more processes will fail, causing the BC job to fail.

*Resolution:* Reschedule the jobs for different times.

*Description:* Another problem that can cause jobs to fail is mounting a clone or snapshot copy of an AIX 5.1 volume group onto an AIX 4.3.3 host, and vice versa. Although BC allows you to configure a job this way, the job will fail.

*Resolution:* Check the version levels of your hosts.

### Can't insert text in fields on Job Create page

*Description:* Inability to insert text in the Name, Owner, and Category fields of the Job Create page.

UNIX OSs with Netscape browsers and JRE versions 1.4.0x may experience a problem entering data in specific fields of the Job Create page. This intermittent problem is a known bug in the Sun Microsystems Bug Database (# 4767070).

*Resolution:* A fix is in JRE 1.4.1\_02. For prior JRE versions, use the mouse to change *focus* away from the current application to another window, and then return to the current application. For example, you can click *focus* away from the applet area by clicking in the upper header area of the BC GUI, and then clicking back within the applet area to regain focus on the text fields.

## HP-UX Host Agent Limitations and Problems

This section describes HP-UX host agent limitations and known problems.

### Error: No Usable Mount Connections Found

*Description:* The HSG80 array controller does not maintain active or “online” connections to an HP-UX host unless a LUN is presented to that host at all times.

*Resolution:* To prevent this problem, make sure that at least one LUN is presented to all HP-UX hosts to act as a mount-on host for BC jobs.

### Error: No Suitable LUN Could Be Chosen

*Description:* The default configuration of the BC host agent for HP-UX supports 8 LUNs (0 to 7) per target. With the default setting, BC will not create LUNs outside this range. However, if LUNs in this range are already being used by other devices, BC jobs may fail.

*Resolution:* No practical limit exists to the LUN range that the BC host agent can support. The 0 to 7 limit was chosen because LUNs outside this range are not supported by many combinations of OS version, array controller, host mode, and Secure Path version. The BC-imposed limit may be increased to the desired level by changing the MAXLUN parameter in the *osvm.ini* file located in the `./opt/CPQevm/bin` directory. You are responsible for ensuring that the chosen MAXLUN value is supported by the OS, array controller, HBA, driver, and Secure Path version.

### Error: Device with LUNWWID"...-xxx wasn't found in system

*Description:* This error message is due to a problem with Secure Path. It affects mount operations and prevents the HP-UX host from seeing the BCV devices.

*Resolution:* Reboot the host. Also, keep a delay of at least six minutes between the end of the undo phase of a job and the start of the next job on the same host.

### BCV Not Persisted After Host Reboot

*Description:* A BCV mounted by BC does not persist across a host reboot.

HP-UX hosts require the kernel to be rebuilt in order for mounted devices to persist across a reboot. Due to the potentially disruptive nature of this operation, BC does not rebuild the kernel.

**Resolution:** If you want BCV devices to be automatically mounted in the event of a reboot, rebuild the kernel.

## Job Failure: Using Volume Groups

**Description:** BC job using volume groups is failing.

Check to make sure that you are not running simultaneous BC job time that are replicating the same volume group. Part of the process of replicating an HP-UX volume group involves placing the volume group that is being copied into a consistent state. BC does this through the use of a utility called `VGfreeze`. If multiple `VGfreeze` processes are executed against the same volume group at the same time, there is a conflict and one or more of these processes will fail, causing the BC job to fail.

**Resolution:** Reschedule the jobs for different times.

Another problem that can cause jobs to fail is mounting a clone or snapshot copy of an HP-UX 11.11 (11iv1) volume group onto an HP-UX 11.0 host, and vice versa. Although BC allows you to configure a job this way, the job will fail.

**Resolution:** Check the version levels of your hosts.

## Job Failure: Mounting Raw Logical Volumes

**Description:** Problems occur during job execution and undo when trying to mount multiple raw logical volumes per volume group.

**Resolution:** Do not create BC jobs that try to mount more than one raw logical volume per volume group. A single raw mount will make all logical volumes in the volume group available. This limitation applies only to raw logical volumes.

## Can't insert text in fields on Job Create page

**Description:** Inability to insert text in the Name, Owner, and Category fields of the Job Create page.

UNIX OSs with Netscape browsers and JRE versions 1.4.0x may experience a problem entering data in specific fields of the Job Create page. This intermittent problem is a known bug in the Sun Microsystems Bug Database (# 4767070).

**Resolution:** A fix is in JRE 1.4.1\_02. For prior JRE versions, use the mouse to change *focus* away from the current application to another window, and then return to the current application. For example, you can click *focus* away from the applet area by clicking in the upper header area of the BC GUI, and then clicking back within the applet area to regain focus on the text fields.

## Solaris Host Agent Limitations and Problems

This section describes Solaris host agent limitations and known problems.

### Mounted BCV Persistence Across Host Reboots

*Description:* BCVs are mounted automatically after reboot of the server.

By default, when BC mounts a Business Continuance Volume (BCV) on a Solaris host, the BCV device file is added to the `/etc/vfstab` file during job execution and removed during job undo. The intent of this activity is to allow any currently mounted BCVs to be mounted automatically in the event of a server reboot. The `OSVM.ini` file in the host `/opt/CPQevm/bin` directory provides a way to disable this functionality.

*Resolution:* To prevent modification of the `/etc/vfstab` file, change the `EDIT_MOUNT_TABLE` setting to **false**.

### Can't insert text in fields on Job Create page

*Description:* Inability to insert text in the Name, Owner, and Category fields of the Job Create page.

UNIX OSs with Netscape browsers and JRE versions 1.4.0x may experience a problem entering data in specific fields of the Job Create page. This intermittent problem is a known bug in the Sun Microsystems Bug Database (# 4767070).

*Resolution:* A fix is in JRE 1.4.1\_02. For prior JRE versions, use the mouse to change *focus* away from the current application to another window, and then return back to the current application. For example, you can click *focus* away from the applet area by clicking in the upper header area of the BC GUI, and then clicking back within the applet area to regain focus on the text fields.

### Job Failure: Mounting Raw Partitions

*Description:* Multiple raw mounts per disk cause problems during job execution and undo.

*Resolution:* Do not mount more than one raw partition per disk. A single mount will make all raw partitions available.



## Tru64 UNIX Host Agent Limitations and Problems

This section describes Tru64 UNIX host agent limitations and known problems.

### Error: OSVM is hanging; Pipe read error!

*Description:* An LSM configuration with eight LUNs on an HSG80 storage system sometimes fails to mount on a Tru64 UNIX cluster. During a `MOUNT` operation in a BC job, LSM commands hang on the cluster. As a result, the job fails to mount. This problem may not be reproducible every time the BC job runs.

If this problem occurs, first undo the job, then rerun the job again. To prevent this problem from occurring, reduce the number of LUNs in the configuration to between four and six.

### Error: Pipe Read Timeout/OSVM Hanging/Mount Operation Time Out

*Description:* This problem applies to BC jobs with large configurations (for example, an AdvFS domain with 64 filesets spread over 8 LUNs). The scan disk command (`hwmgr -scan scsi`) for HP Tru64 UNIX may take more time than the value specified in `PIPE_READ_TIMEOUT`. This time limitation can cause the BC job to fail.

Similarly, during a mount operation, methods in the HP Tru64 UNIX STOCFG library and the `voldg flush` command can take a long time to return, causing the BC job to fail.

*Resolution:* Follow these steps:

1. Undo the job.
2. Remove the mount points on the host where the volume is mounted.
3. If possible, reboot the host on which the mount operation was performed.
4. Rerun the job.

## Errors: SCSI CAM Driver

*Description:* During AdvFS domain replication operations, certain recoverable events might generate SCSI CAM driver errors.

These errors are recoverable if **AdvfsIORetryControl** is not set to the default value (0). The default setting *does not* attempt retries and can result in domain panic.

*Resolution:* To prevent domain panic, set the **AdvfsIORetryControl** parameter to a value greater than **0**. HP recommends setting this parameter to **1**.

Check the current **AdvfsIORetryControl** setting using the following command:

```
/sbin/sysconfig -q advfs AdvfsIORetryControl
```

Change the setting using the following command:

```
/sbin/sysconfig -r advfs AdvfsIORetryControl=nn
```

Where **nn** equals the number of AdvFS retries.

This problem is described further in Quality Assurance Review (QAR) 93940.

## Error: Host Has Utility Locked

*Description:* <host\_name> has this utility locked. Use the -1 option if safe to override

*Applies to:* Tru64 UNIX using LSM in a clustered environment.

This may occur in environments where multiple processes are using the same volclonedg script for different nodes. Tru64 UNIX locks the script by creating a soft link (for example, /etc/vol/lsmclonelock) that points to the processing cluster node.

*Resolution:* To remove the lock:

1. Run: volclonedg -1
2. Confirm that the lock is removed by running:

```
ls /etc/vol/lsmclonelock
```

The response should be:

```
ls: /etc/vol/lsmclonelock not found
```

## Error: Remote Spawn Request Failed

*Description:* BC does not support replicating and mounting an LSM disk group or AdvFs Domain that has no filesets, or a job based upon an UNMounted fileset.

*Applies to:* Tru64 UNIX using LSM or AdvFS.

*Resolution:* None at this time.

## Clusters Are Not Displayed in Save/Restore List

*Description:* TruClusters do not display in the Hosts drop-down list when you choose Configuration page > Save/Reload.

Nonclustered Tru64 UNIX hosts are displayed.

*Resolution:* None at this time.

## Can't insert text in fields on Job Create page

*Description:* Inability to insert text in the Name, Owner, and Category fields of the Job Create page.

UNIX OSs with Netscape browsers and JRE versions 1.4.0x may experience a problem entering data in specific fields of the Job Create page. This intermittent problem is a known bug in the Sun Microsystems Bug Database (# 4767070).

*Resolution:* A fix is in JRE 1.4.1\_02. For prior JRE versions, use the mouse to change *focus* away from the current application to another window, and then return back to the current application. In BC, for example, you can click *focus* away from the applet area by clicking in the upper header area of the BC GUI, and then clicking back within the applet area to regain focus on the text fields.

## Job Failure: Using Volume Groups

*Description:* BC job using volume groups failed.

Part of the process of replicating an AdvFS domain involves placing the volume group that is being copied into a consistent state. BC does this through the VGfreeze utility. If multiple VGfreeze processes are executed against the same volume group at the same time, one or more processes will fail, causing the BC job to fail.

*Resolution:* Reschedule the jobs for different times.

## Windows Host Agent Limitations and Problems

This section describes Windows host agent limitations and known problems.

### Error: System Error 5. Access Denied

*Description:* Commands passed (spawned) from SMA processes and batch files onto NT 4.0 domain members will fail. The problem occurs because the Switchboard service is registered to utilize system account SIDs instead of the necessary SID for any given command.

*Resolution:* Register the Switchboard service to interact with an account that has the appropriate security privileges to execute the given command (for example, Administrator).

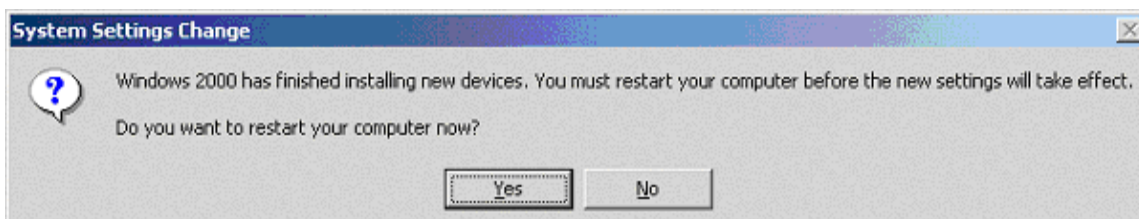
### Error: Using MOUNT VOLUME\_ALL

*Description:* MOUNT VOLUME\_ALL does not work on Windows computers and will cause jobs failures.

*Resolution:* Do not use the MOUNT VOLUME\_ALL operation for mounts on a Windows host.

### System Settings Change Pop-up

*Description:* When BC mounts a BCV, Windows may intermittently display a pop-up window (see [Figure 9](#)). This pop-up window is modal and must be acknowledged before additional MOUNT operations will complete.



**Figure 9: System Settings Change pop-up window**

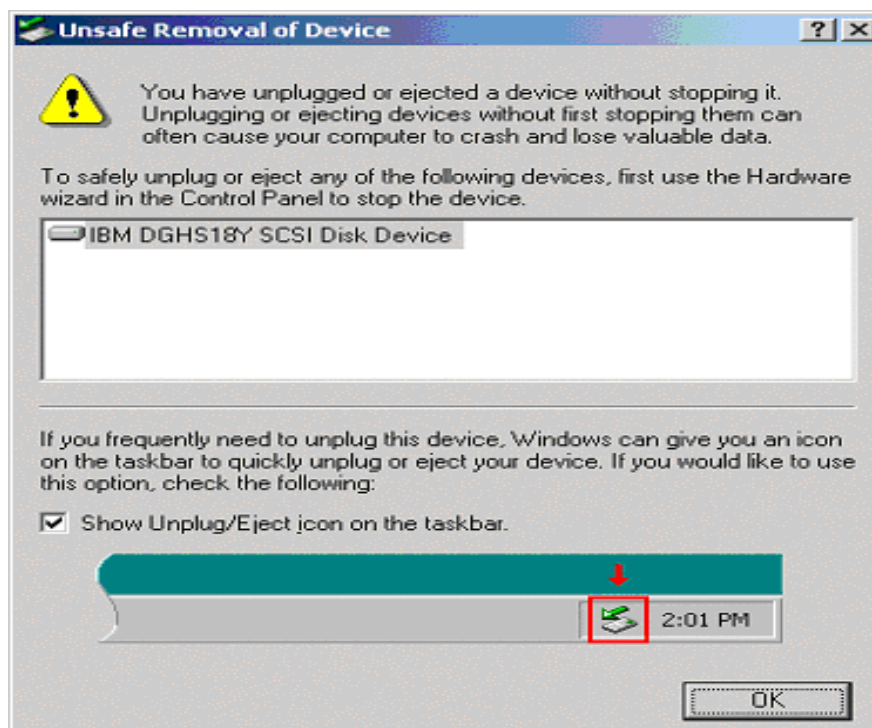
*Resolution:* To prevent this problem, do not log into the Desktop. Because the BC host agent runs as a Windows service, BC can function without logging into the system.

## Unsafe Device Removal Pop-up

*Description:* Unsafe Device Removal pop-up

*Applies to:* Windows 2000 only.

Each time BC dismounts a BCV, Windows 2000 displays a pop-up window similar to [Figure 10](#).



**Figure 10: Unsafe Removal of Device pop-up window**

*Resolution:* The pop-up window *does not* indicate a problem and is harmless. Click **OK** to clear the window. However, additional BCV dismounts cause more pop-up windows to display. If running BC jobs via an automated scheduler while the mount-on host has been left unattended, these windows can stack up on the Desktop and consume memory. To prevent this, do not login to the desktop; because the BC host agent runs as a Windows service, BC can function without logging into the system.

## Mounts and Dismounts Fill Up the Event Log

- Description:* Despite the plug-and-play nature of Windows 2000, this operating system is not fully compatible with the dynamic mount and dismount operations performed by BC. One side effect is that each mount and dismount can generate entries in the Event Log. Device arrival and departure notifications from the Removable Storage Manager (RSM) service are the most common events. If Secure Path is installed, the *raidisk.sys* driver may also report path-failure errors during device removal.
- Resolution:* These Event Log entries are not an indication of a problem and can be ignored. However, BC implementations that involve heavy mount/dismount activity can generate a significant number of log entries. When sizing the Event Log, size the log accordingly.

## Drive Letter Assignments Do Not Persist Through a Host Reboot

- Description:* The drive letters that BC assigns to dynamically mounted devices do not persist through a host reboot. The BCV devices remain present after the reboot, but may have different drive letters assigned to them.
- Resolution:* This change in drive letter assignment does not affect BC functionality. BC can still remove the devices during execution of the job undo.

## Mounting Problems

- Description:* **BC jobs not mounting properly.**

If a Windows NT host computer is rebooted while BCV devices are mounted, the storage configuration of currently mounted devices changes in a way that prevents additional BC jobs from mounting properly. This configuration change does not prevent the BC job that mounted the BCVs from undoing properly.

- Resolution:* Make sure to undo any jobs that caused BCVs to be mounted on the host in question and then reboot the host again. These actions reset the storage configuration to a known good state and allow BC jobs to run normally.

- Description:* **Dynamic Disks specified as source units for BCVs cannot be mounted.**

- Resolution:* Dynamic Disks are not supported.

- Description:* **Job fails with error: New drive letter did not arrive.**

- Resolution:* Under certain circumstances, Windows 2000 and Windows 2003 may prevent a drive letter from being assigned to a newly-mounted BCV. This may lead to a failure of the BC job. There are several possible causes for this problem:

■ **There is no filesystem on the source.**

Clones and snapshots (BCVs) are point-in-time copies of their source volumes. If there is no filesystem on the source, the BCV will not contain a filesystem. For a device to be dynamically mounted on Windows, the device must contain a properly partitioned and formatted basic NTFS filesystem. Devices that do not contain filesystems can still be mounted using the **RAW** option in the MOUNT step, but will not be assigned a drive letter.

*Resolution:* Place a supported filesystem on the source or use the **RAW** MOUNT operation.

■ **The filesystem on the source is unsupported.**

BC supports homogeneous NTFS basic filesystems only. Windows Dynamic disks are not supported, nor are the FAT32 filesystems, or any third-party filesystems. The source version of the filesystem to be mounted must also be native to the Windows version that is being mounted as the destination. For example, Windows NT4 volumes cannot be mounted on Windows 2000 systems; Windows 2000 volumes cannot be mounted on Windows Server 2003 systems, and so on.

*Resolution:* Use a supported filesystem.

■ **The filesystem on the source is partially corrupt.**

Minor inconsistencies in the source volume's filesystem can prevent the mount-on host from recognizing the BCV as a valid device. This condition may exist even if the source volume appears to be functioning normally. This is a rare condition that appears to happen most often with devices that were reverted to basic disks from Dynamic disks, or were originally created on an older version of Windows.

*Resolution:* Run `chkdsk` on the source volume and repair any problems that may exist. In extreme cases, it may be necessary to back up the source volume, then completely delete it and recreate it.

■ **The incorrect version of Secure Path is being used.**

Some versions of Secure Path prior to v4.0B, SP1 had problems that prevented drive letters from being assigned to new devices.

*Resolution:* Upgrade to Secure Path v4.0B, SP1 or later.

■ **User has logged into the desktop of the mount-on host.**

The System Settings Change pop-up that appears intermittently on some Windows system (see “[System Settings Change Pop-up](#)” on page 140) will interfere with MOUNT operations and prevent the assignment of drive letters to new devices.

*Resolution:* Log off the desktop. If it is necessary to log in, ensure that any System Settings Change pop-up windows are acknowledged within 15 seconds of their arrival.

■ **The wrong partition was specified in the MOUNT operation.**

If UNIT style operations are used in a BC job, it is your responsibility to ensure that the correct partition number is entered in the MOUNT step. For example, some disks contain an 8MB EISA configuration partition as the first partition. If you choose a disk like this as the source for a BC job, you must remember that the relevant filesystem resides on partition 2 of the disk.

*Resolution:* Ensure that the correct partition is specified in the MOUNT step of any UNIT style job. Alternatively, use VOLUME style operations for all BC jobs; partition associations are handled automatically with VOLUME style jobs.

## Applications Restrict Access or Require Privileges

*Description:* By default, processes executed by the SUSPEND, RESUME, LAUNCH, and LAUNCHUNDO job operations have the permissions of the System account. Some applications, such as Oracle®, Microsoft Exchange, and Computer Associates BrightStor, restrict access to certain accounts or require privileges that are not available to the System account.

*Applies to:* Windows 2000 and NT.

*Resolution:* These cases can be supported by changing the account used by the BC host agent service (Switchboard).

■ To make this change for Windows 2000 host computers:

1. Choose **Start > Run**.
2. Type `services.msc`.
3. Click **OK**.

The Services window opens.

4. Right-click on the Switchboard service and select **Properties**.

The **Switchboard Properties** dialog box displays.



5. Click the **LogOn** tab.
  6. Check **This account**.
  7. Type the desired account name and password.
  8. Click **OK**.
  9. Verify that no BC jobs are running.  
If BC jobs are running, wait until the job completes.
  10. Restart the BC Switchboard service to allow the changes to take effect.
- To make this change for Windows NT host computers:
1. Choose **Start > Settings > Control Panel > Services**.  
The Services window opens.
  2. Locate and highlight the BC Switchboard service.
  3. Click **Startup**.  
The Services window opens.
  4. Check **This Account**.
  5. Type the desired account name and password.
  6. Click **OK**.
  7. Click **Close**.
  8. Verify that no BC jobs are running.  
If BC jobs are running, wait until the job completes.
  9. Restart the BC Switchboard service to allow the changes to take effect.

## Mapped Network Drive Problem in Windows Server 2003

*Description:* The indicated drive letter within the BC job does not map properly.

Active, mapped network drives are displayed on all host computers except for Windows Server 2003. This known issue can potentially lead to situations in which BC jobs that mount BCVs on these hosts will run to completion, but *will not* actually mount the BCVs.

For example, if a BC job mounts a BCV as drive letter T:, even if T: is already in use, the job will run to completion. However, the BCV *will not* be mounted, and drive letter T: will continue to be the mapped network drive. Once the BC job is completed, you will have to manually mount the BCV (using an available drive letter).

*Resolution:* Make sure that mount operations conducted on Windows Server 2003 hosts *do not* conflict with any mapped network drives that may be present on the mount-on host.

## **Extra Disk Icon with Question Mark Displays in Windows Server 2003 Explorer View**

*Description:* The Explorer view in Windows Server 2003 occasionally displays an extra disk icon with a question mark (?) when new BCV devices are mounted. This extra icon is a side effect of the dynamic device mapping process and *does not indicate a problem*.

*Resolution:* Close and re-open the Explorer window to remove the extra disk icon.

# BC Network Configuration Worksheets



This appendix contains worksheets that you can print out and use for planning your BC network.

Component	Current Version	Tasks
BC Server		
SMA Hardware		
SMA Software		
HSG Element Manager		
Command View EVA		

Figure 11: BC network configuration worksheet

BC Host Computer						
Components						
Host Computer	OS	FCA/HBA	Solution Kit	Secure Path	BC Version	Tasks
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						

**Figure 12: Host computer worksheet**

BC Storage Systems				
Components				
Storage System Name	Controller	ACS	VCS	Remarks
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				

Figure 13: Storage systems worksheet



This glossary defines terms that are used in this guide or are related to BC.

**ACS**

Array Controller Software. The software and firmware that, together with the hardware, implement the features of StorageWorks array controllers. Different versions are optimized for specific applications. ACS V8.6S-11, for example, provides a variety of features, including clone and snapshot.

**agent**

In a client/server system, a program that performs information gathering or processing tasks on behalf of a client or server. Agents often communicate with other agents to perform a collective task on behalf of the user.

StorageWorks agents run on storage system host computers and can be accessed by StorageWorks clients to control and manage the storage system.

**BCV**

Business Continuance Volume. A generic term for a virtual disk that is created from a standard production volume. A BCV can subsequently be used in production tasks such as backups, application migration, data mining, and testing. A key feature of a BCV is that it can be accessed while the production volume remains online for normal I/O. The term *BCV* does not imply the use of any specific technology.

**BC network**

A network that consists of BC-enabled computers that are connected to a common LAN and to BC-compatible StorageWorks storage systems.

**CLI**

Command Line Interpreter or Interface. In StorageWorks, a text-oriented command line interface that enables configuration and monitoring of an HSG-based storage system by manually issuing commands to the array controller.

## **CLI commands**

The set of commands supported by StorageWorks HSG Array Controller Software. For example, the command `SHOW DISKS` displays a list of disks attached to the controller.

## **client**

A computer or program that requests a service of another computer in a client/server system.

## **clone**

In StorageWorks, an HSG controller-based method of creating a physical copy of a virtual disk. A duplicate member is created and members of the mirrorset are normalized to ensure that the data are identical on each member. During creation and normalization, the original remains online. Normalization of members is not instantaneous, but depends on factors such as disk size and I/O activity. Virtual disks created by the clone method are often used for tasks such as backups and application testing. The clone method cannot be used with RAID 3/5 units.

## **container**

In StorageWorks, a logical volume identifier that the HSG controller uses to represent disks in a storage set. For example, the container identifier *M3* could represent a RAID 1 two-disk mirrorset.

## **daemon**

Diagnostic and Execution Monitor. Pronounced “demon.” A program usually associated with a UNIX system that performs a utility (housekeeping or maintenance) function without being requested or even known by the user.

## **demand-allocated snapshot**

A point-in-time copy of a specified virtual disk (LUN). The HSV controller initially allocates only a small amount of space for the snapshot disk, just enough to store point-in-time information and pointers to data on the source. As data on the source are overwritten, the controller increases the allocated space for the snapshot and copies the original (point-in-time) data from the source to the snapshot. If all of the original data on the source are overwritten, the controller will have increased the allocated space on the snapshot by an amount equal to the full size of the source.

## **device**

A hardware unit such as a computer, disk, tape, router, hub, or adapter that can be attached to a host or network.

## **Element Manager**

A Web-based storage environment manager that enables users to configure and monitor HSG and HSV controllers. The element manager resides on the Storage Management Appliance (SMA).



**Fibre Channel**

A high-speed, serial bus technology that supports channel and network architectures and a variety of transmission media and protocols. Fibre Channel Arbitrated Loop (FC-AL) is a standard designed for mass storage and other peripheral devices. FC-AL uses optical fiber to achieve transfer rates up to one GB per second.

**fully allocated snapshot**

See [snapshot](#).

**host**

In StorageWorks, the controlling computer to which a storage system is attached.

**job (BC job)**

A file created by BC that represents a user request to perform a task or series of tasks. For example, the BC job named *stor1\_backup\_daily\_sales* might:

1. Replicate a storage unit by the clone method to create BCV units
2. Mount the BCV units on a server
3. Start the tape backup of the BCV units

Jobs can be created and run from the GUI, from the BC Command Line, from script files, or from a scheduler.

**LUN**

Logical Unit Number. In a storage system, the value that identifies logical storage units of a SCSI target device.

**mount point**

In UNIX systems, the directory to use for mounting a device. For example, the `/usr` directory could be the mount point for the disk device `/dev/dsk/c0t1d0s6`.

**node**

A generic term for an addressable unit, such as a computer or peripheral device attached to a network. In BC, a BC-enabled computer that is connected to the BC network.

**OpenView**

An HP line of software products that provides storage management solutions, data protection and recovery, automatic performance tuning, storage virtualization, and other features for multivendor storage environments.

See also SANworks.

See also StorageWorks.

**RAID**

Redundant Array of Independent Disks. A set of techniques for configuring and using an array of physical disks to provide fault tolerance and increase performance of a storage system.

**SAN**

Storage Area Network. A dedicated, high-speed network of storage devices that are available to servers on a local area network (LAN) or wide area network (WAN). As storage devices are added to the SAN, they become accessible to the servers in the larger network.

**SANworks**

An HP line of software products that provides storage management solutions, data protection and recovery, automatic performance tuning, storage virtualization, and other features for multivendor storage environments.

*See also* [OpenView](#).

*See also* StorageWorks.

**scheduler**

An application that schedules and runs tasks. A typical scheduled task in the StorageWorks environment is running a BC job that replicates storage units for use in tape backups.

**server**

A computer or program that provides a service to other computers in a client/server system. Servers often run continuously, waiting for requests from clients.

**SMA**

*See* [Storage Management Appliance \(SMA\)](#).

**snapclone**

A BC HSV job operation that creates a complete point-in-time (clone) copy of a specified virtual disk (LUN). An HSV snapclone is a copy that begins as an HSV fully allocated snapshot, but then becomes an independent virtual disk.

**snapshot**

In StorageWorks, a nearly instantaneous controller-based method of creating a virtual copy of a virtual disk. During creation, the original remains online and there is no interruption of operations. The virtual copy consists of a bitmap stored in the array controller cache (not on disk) and a temporary file that holds data that have been overwritten since the snapshot was created. Copies created by the snapshot method are typically used to conduct short-term tasks such as backups.

**Storage Management Appliance (SMA)**

A host-independent server product designed to connect directly to the SAN fabric. The SMA provides a centralized point for managing and monitoring SAN elements, including HP switches and storage arrays.

SMA software installed on the appliance provides a GUI interface for accessing the monitored SAN environment. The SMA software also provides a launch site for a variety of value-added HP OpenView applications and provides navigation links to directly manage storage components on the SAN.

**storage system**

From the perspective of a host, each addressable StorageWorks array controller pair and their attached physical disks.

**StorageWorks**

The HP line of hardware and software storage solutions for multivendor server environments. They provide storage management solutions, data protection and recovery, automatic performance tuning, storage virtualization, and other features for multivendor storage environments.

*See also* OpenView.

*See also* SANworks.

**TCP/IP**

Transmission Control Protocol/Internet Protocol. A suite of communications protocols used to connect host computers to the Internet.

**undo**

A special job file that is automatically created by BC for “undoing” steps that have been completed in a user-created job. For example, the job named *undo\_stor1\_backup\_daily\_sales* could be run after a tape backup was completed. The undo job would unmount the BCV units and return their disks to the pool of free storage resources.

**VCS**

Virtual Controller Software. Provides storage controller software capability for the HSV-based storage systems. Dual redundant HSV controllers are configured into the StorageWorks Enterprise Virtual Array.

**virtual disk**

In StorageWorks, a logical volume identifier that the controller uses when a container is mounted on a host computer. For example, the unit identifier *D1* could represent a RAID 0+1 striped mirrorset that is mounted on a host computer. StorageWorks disk units begin with the letter “D” and tape units begin with the letter “T.”

**volume group**

A set of one or more physical volumes from which space can be allocated to one or more logical volumes.

**volume**

A generic term for a storage unit, such as a hard disk, floppy disk, disk cartridge, CD-ROM, or tape cartridge.

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